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NEWER FINDINGS IN VITAMIN RESEARCH[1]

C. A. ELVEHJEM, PH.D.
Department of Biochemistry, University of Wisconsin

MANY of you have read the Final Act and Section Reports of the United Nations Conference on Food and Agriculture. This conference will have an influence on the applications of the experimental findings in nutrition for many years to come; in fact Dr. Boudreau has stated that the meeting at Hot Springs, Virginia was potentially one of the most important international conferences ever held in any country. Looking at the report from the point of view of dietitians I imagine the most significant statement is found under Part I in Appendix I, namely: "The first step in planning a nutrition program for any country should be to determine the needs of the population for health in terms of the more important nutrients."

This is the goal which nutritionists have been hoping and planning for, but now we are asked to apply it in practice. The war has hastened the developments in many fields of endeavor but few have shown greater progress than nutrition. We find the best example in England. In 1929 J. B. S. Haldane wrote, "We have, it is true, a department humorously called the Ministry of Health, but it is not realized that State action influences the national health except through such agencies as drains, water supply and medical officers of health." Contrast that to a recent report: "The distribution of food was planned with the assistance of nutrition experts so as to assure to each section of the commonwealth an equitable share of the food needs for the maintenance of health."

I am certain that the nutritionists in this country will meet the challenge which is now before us. Let me remind you again that the conference recommended that governments should "immediately undertake to increase their food resources and improve the diets of their people." There will be many obstacles to overcome but I believe you will agree that the greatest will continue to be the lack of fundamental information. To me it seems most unfortunate that no definite plan has been made by the Government to maintain properly trained biochemists in the laboratory so that the fundamental studies can proceed even during the height of our war activity. Dr. Boudreau states that pellagra is obviously one of our chief deficiency diseases and yet I know of no long-time experiment either contemplated or completed to determine the true nicotinic acid requirement for humans.

So much for general policy. I have been asked to discuss how the newer findings in vitamin research may be applied to your present problems. I propose to do so under three headings:

1. Vitamin Requirements.
2. Vitamin Supply in Our Foods.
3. Significance of the Newer or Un-Isolated Factors.

VITAMIN REQUIREMENTS

Theoretically the question of vitamin requirements should be disposed of by mentioning that the values for the better known vitamins have been established by the Food and Nutrition Board and the other factors can be discussed under part 3. Many of us have watched with considerable satisfaction the general acceptance of the recommended dietary allowances. There have been some friendly differences of opinion but no scientific evidence has been presented to show that any of the values are grossly in error. Some workers feel that the values for certain of the vitamins are too generous. It must be emphasized that the Food and Nutrition Board intended that the values should be considerably above the minimum requirements, which is why they are referred to as allowances. These values are used to represent optimum nutrition, and were established before the war when there was no indication of limited food supplies. Certain temporary modifications may have to be made during the emergency but I am sure the more generous values will be useful after the war is over. The Committee on DietaryAllowances under the chairmanship of Dr. Lydia Roberts is evaluating every new bit of evidence and will recommend proper revisions when the experimental results are available.

It is true that some very recent studies indicate that adults may be maintained without obvious evidence of deficiency on diets somewhat lower in thiamin and considerably lower in riboflavin than the figures given in the dietary allowances (1, 2). If we examine all the studies that have been made we find that the earlier experiments were made by depleting the patients of thiamin or riboflavin and then measuring the amount needed to produce saturation over a relatively short period of time. The more recent studies have involved the maintenance of the subjects on diets containing limiting amounts of thiamin or riboflavin and watching for any possible signs of deficiency. It is evident, I believe, that in one case the patient was on the ascending side of optimum nutrition and in the other case on the descending side. It takes more gasoline for a car to climb a hill than to coast down the other side.

If we accept this possibility as an explanation for the variable results which have been reported we must agree that the body is capable of considerable storage of the vitamins. It is generally accepted that the body may maintain, largely in the liver, appreciable amounts of the fat-soluble vitamins, but the storage of water-soluble vitamins is assumed to be more limited. We should not overlook the fact that the body is made up of over 40 per cent muscle tissue and that these tissues may vary within limits in vitamin content. Ferrebee *et al.* (3) found that in poorly nourished patients the heart, skeletal muscle, liver and kidney cortex all contained less thiamin per gram of tissue than did like tissues in patients with higher thiamin intake. We (4) have recently found that the thiamin content of muscle from rats on an intake of 8γ per day averaged 0.3γ per gram, and .8γ per gram when the rats received 25γ thiamin per day. A difference of 0.5γ per gram in the muscle tissue of a 70-kg. man would equal about 14 mg. of the vitamin—a quantity sufficient to allow for a difference in daily intake of .25 mg. for a period of 2 months.

The riboflavin content of rat muscle was reduced from 2.7γ per gram to 2.0γ per gram of fresh tissue by decreasing the intake from 30 to 8γ per day. It should be emphasized that in both cases the lower intake of the vitamins did not produce a vitamin deficiency; in fact, that rate of growth was only slightly reduced.

The results given in Table 1 are even more striking because in this case we are not dealing with the vitamin itself but with a form which is actively functioning in the tissues. Chicks were used because rats do not need niacin preformed in the diets. A supplement of 1.5 mg. niacin per 100 gm. of this basal ration allowed maximum growth of all the chicks, but an intake of 10 mg. per 100 gm. ration resulted in a large increase in the coenzyme I content of all the tissues except the heart. The change was especially large in the breast muscle. At present we cannot determine whether the muscles were functioning more efficiently with the higher coenzyme content, but we do know that this higher level provided the chick with a

[1] Read before the American Dietetic Association, Pittsburgh, October 21, 1943.

pretty good cushion for the rough spots ahead. When we used to take auto trips we enjoyed properly inflated rubber tires. It is true that our forefathers traveled some of the same trails in covered wagons, but their speed was much less and not all of them survived. So if we are looking for smoother traveling for the human body the maximum reserves may be most helpful.

I have also observed that the investigators reporting the higher requirements have worked with patients in institutions, neurotics or prisoners with infections, etc., while those recording the lower requirements have worked with robust young men, soldiers or college students. Surely the degree of efficiency must be much greater in the latter groups. Whether the higher efficiency is due to better absorption of the nutrients from the digestive tract or better utilization within the tissues cannot be answered at present but I hope the answer may be obtained in the near future. One might argue that we are merely being pampered by using the higher values and we should use our influence in improving the physical state of all individuals. That may be a good course to take, but even so, we will find great individual variations and until all the facts are available there can be no harm

TABLE 1

Coenzyme I content of tissues from chicks receiving different levels of niacin

NIACIN ADDED	WEIGHT AT 4 WEEKS	COENZYME I CONTENT			
		Breast muscle	Leg muscle	Liver	Heart
per 100 gm. ration	*gm.*	*mcg./gm. fresh tissue*			
None	193	95	60	467	235
1.5 mg.	260	181	175	440	219
10 mg.	261	607	285	710	258

in using in a sensible manner the rather generous values now recommended.

There have been many arguments about the human vitamin C requirement and considerable emphasis has been placed upon the low incidence of scurvy in England as measured by clinical evidence, in spite of the low intake of ascorbic acid and the very low blood values encountered in a large percentage of the population. A low-plasma level does not necessarily mean a severe depletion of the vitamin in the tissues but it would take rather careful balancing to maintain such a condition without some disturbance in the tissues. In this connection I might mention some preliminary results obtained by Dr. Shaw, in our laboratory, on monkeys. The animals were maintained on purified diets in a chronic state of deficiency by feeding .25 mg. ascorbic acid per kilogram body weight. After several months the animals showed all the typical symptoms of scurvy but much to our surprise they failed to respond satisfactorily to higher doses of the vitamin. Apparently the changes were so severe that repair was very slow. Whether such conditions might appear in humans is, of course, unknown, but it is important to point out that the level of ascorbic acid used to produce the chronic deficiency would be equivalent to 15 to 20 mg. per day in humans.

VITAMIN SUPPLY IN OUR FOODS

The vitamin supply in our foods also appears to be a relatively simple problem with the availability of the greatly improved methods of assay. Some of us may have been a little too optimistic about the rate of accumulation of data on the vitamin content of foods and after a year's experience in trying to correlate data from different laboratories I am willing to admit that not only the methods but the analysts need perfecting. The methods now in use for thiamin, riboflavin, niacin and ascorbic acid are fundamentally sound, but some improvements may be needed in the methods for vitamin A and carotene when they occur together. Zscheile, Beadle and Kraybill (5) have reported extensive studies on green vegetables using the spectrophotometric method and separating beta-carotene and neo-beta-carotene. Oser *et al.* (6) have recently discussed the relative results obtained on mixed food by spectrophotometric and Carr-Price methods.

This does not mean that the various methods can be applied to any food and in any laboratory, but I have seen almost identical results on the same samples obtained in several different laboratories when the workers have had adequate experience with the method. I have also seen considerable variation, but much of the difficulty is apparently related to lack of homogeneity in the samples. This is often true when microbiological methods are used because such a small sample is needed. Large samples of dehydrated foods, meat products, etc. must be properly homogenized before an aliquot can be taken. Some have gone so far as to suggest that the best way to get acceptable values for the vitamin content of foods was to have the food analyzed in one laboratory and not allow the analyses to be repeated the next day. Seriously, I believe we can now accept most of the vitamin values with considerable confidence, in fact the figures for the better known vitamins may be more accurate than those for proximate analyses and for mineral elements. It is unnecessary to discuss individual figures since another session at this meeting will deal with the compilation of the newer values[2] but I would like to say a word about the practical use of the finished tables.

It is becoming more apparent that all groups of food materials contribute to the final adequate diet. Optimum nutrition is more likely to result from a proper combination of all food groups than from a continual emphasis on certain selected groups. In a recent survey of the proteins in the food served in the R. A. F. messes it is interesting to note that 21 different foods contributed to the protein intake to the extent of 1 per cent or more of the total intake. We must also differentiate between the foods in the same groups. For example, great emphasis is now being placed on whole-grain cereals; however, the niacin content of corn will never reach the value for wheat nor will the thiamin content of any other cereal equal that for oats.

Furthermore, it is necessary to use the values for the foods as they are consumed. My guess is that you are now expecting a discussion on cooking losses but I am going to be brave enough to relegate cooking losses to third or fourth place and emphasize the other factors affecting the vitamin content of our food as consumed. The loss on processing has been recognized in the case of flour and bread and after a tremendous amount of effort white bread equivalent to whole wheat bread, as far as certain nutrients are concerned, is now available in all markets. But there is still a problem in the case of prepared breakfast cereals. It is easy to speak of whole-grain cereals; however, these cereals not only differ in original composition but the losses during processing show even greater variations. The Food and Nutrition Board has established the range of values for whole-grain cereals but many products available in the grocery stores fall below this range. There is, of course, no objection to the sale of such products as long as the consumer is able to differentiate between them. Some of these values are given in Table 2. Incidentally, we have found no loss in the vitamin content of cereals during cooking.

At present much time and effort are being spent on the loss of vitamins during the cooking and dehydration of foods. I would be the last one to minimize these studies but I

[2] *See* following paper, this JOURNAL.

do think it is important that some consideration be given to the vitamin content of the foods when they are about to be cooked or dehydrated. During a period of 48 hours at room temperature the following losses of ascorbic acid occur while in the raw state: spinach 70 per cent, lettuce 70 per cent, broccoli (flowers) 65 per cent, green beans 25 per cent and Swiss chard 65 per cent. All these losses are greatly reduced by proper refrigeration. Just one example: fresh spinach may contain 80 mg. per 100 gm., but if it is left at room temperature for 2 days the value is reduced to 23 mg. If special precautions are taken in cooking this spinach you may reduce the loss from 90 to 50 per cent, a saving of 10 mg. of the vitamin. By proper refrigeration prior to cooking it would have been possible to save 57 mg.

Most of us accept the losses during dehydration and canning as inescapable but many of these losses can be reduced as easily as those encountered in the final cooking procedure. It is important to point out that losses occur in dehydrated foods during storage at elevated temperatures. Losses in carotene and ascorbic acid were expected but we now know that thiamin disappears very rapidly in practically all dehydrated foods when they are stored at temperatures about 80°F. Recent studies, however, show that riboflavin and niacin are retained completely under similar conditions.

There are two other reasons why I am not too perturbed about cooking losses. There is considerable interest in improved cooking methods and evidence of this better

TABLE 2

Vitamin content of prepared cereals

	THIAMIN	RIBOFLAVIN	NIACIN
	mg./100 gm.		
Whole wheat	0.44–0.66	0.09–0.20	5.4 – 8.0
Prepared wheat cereals	0.05–1.50	0.05–0.48	0.7 –17.0
Whole corn	0.37–0.58	0.08–0.48	1.7 – 2.7
Prepared corn cereals	0.10–0.45	0.06–0.20	0.9 – 2.1
Whole oats	0.66–0.88	0.12–0.17	0.88– 1.76
Prepared oat cereals	0.58–1.50	0.11–0.32	0.60– 2.2

vitamin retention through their use is now available. Second, with the exception of vitamin C the actual losses are not so great as most people have assumed them to be. Extensive studies on meat (7) show that the average thiamin retention for all meats by all methods of cooking will not be lower than 70 per cent and the retention of riboflavin and niacin is practically complete. In a recent paper by Fenton *et al.* (8), the following statement was included in the conclusions: when steamed in quantity, commercially-dehydrated beets, cabbage, potatoes, and rutabagas retained 82, 88, 87 and 74 per cent, respectively, of their thiamin content. The remainder of the thiamin was found in the small amount of cooking water present. We need to take a sensible point of view. Every effort should be made to reduce the losses but we cannot expect to bring every food to the table with complete vitamin retention. Every time we remove the juice from an orange, 70 per cent of the ascorbic acid remains behind. A potential supply far greater than that retained in certain vegetables through better cooking, is thus lost.

SIGNIFICANCE OF THE NEWER OR UN-ISOLATED FACTORS

In spite of all our attempts to put nutrition on a quantitative basis, optimum health is not obtainable as long as a single vitamin is missing. We may know the exact requirements for all the recognized vitamins and we may have one hundred different combinations of foods which will supply these amounts, but the presence or absence of the final necessary factor determines how efficiently the body will function. I have said very little if anything about pyridoxine, pantothenic acid, etc., not because I feel that they are not essential in the human diet, but because they are so generally distributed that a deficiency is much less likely to occur than in the case of thiamin, riboflavin or niacin. However, I do feel that some of the still newer factors may be of more significance because of their more limited distribution and because they are more readily inactivated.

Time does not permit any extensive discussion on the existence and importance of these newer factors. Since no one has maintained humans on a highly synthetic diet and since no symptoms have been related to a deficiency of these newer factors in humans I can give you no direct proof of their significance, but the indirect evidence may be summarized as follows:

1. Rats grow almost normally on a synthetic diet containing vitamins A, D, E, thiamin, riboflavin, niacin, pyridoxine, pantothenic acid, and choline. Reproduction also takes place although there is some difficulty in lactation. If .5 to 1 per cent of a sulfa drug such as succinylsulfathiazole is added to this diet there is failure of growth, increased clotting time of the blood and leukopenia. The deficiencies are corrected by adding vitamin K, biotin and a preparation of folic acid.
2. Hamsters will grow and survive on the above ration only when biotin and inositol are added.
3. Mice require added inositol.
4. Chicks require added biotin and a preparation from liver or yeast which carries at least two factors separate and distinct from folic acid as measured by either the *L. casei* or *S. lactis.*
5. The cotton rat will not grow until a liver preparation is added in addition to biotin, inositol and para-aminobenzoic acid.
6. The monkey fails completely on the synthetic diet, shows poor growth, leukopenia and dysentery. A crude folic acid concentrate supplies all the necessary factors.
7. Guinea-pigs will grow normally only when a number of natural products are added.

Some of these factors may never find an important place in the human diet but I would be greatly surprised if we do not need a few of these un-isolated factors. Even if they are not needed directly, a more complete understanding of their chemistry and functions will undoubtedly be of great help in explaining the variations now encountered in quantitative figures for some of the vitamins. In the light of these recent studies I doubt that you can continue to use the recommended daily allowances and the present tables on food composition without worrying just a little about the unknown factors.

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COMPILATION OF RECENT DATA ON MINERAL AND VITAMIN VALUES OF FOODS

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THIS third compilation of recent data on mineral and vitamin values of foods is a continuation of a project assumed by a subcommittee of the Diet Therapy Section of the American Dietetic Association under the direction of Dorothea Fletcher Turner, section chairman. (*See* this JOURNAL for September 1942 and for July 1943.)

Increasingly active research in the field of vitamin and mineral content of foods is indicated in the growing list of publications reviewed for each succeeding compilation. Sixty-two articles, covering mainly the period from January to June 1943 and including the first progress reports of the national cooperative project on the conservation of nutritional values of food now under way in a number of state agricultural experiment stations, have been reviewed for this report.

Continued interest in the distribution of the members of the vitamin B complex in foods has been noted, with particular emphasis on the perfection of microbiological methods for the determination of riboflavin and niacin (*see* this JOURNAL, September 1942). A microbiological assay for riboflavin (*Indust. & Engin. Chem., Anal. Ed.*, **11,** *346, 1939*) has been employed successfully on a large variety of biological materials, but it is recognized that the microbiological method gives higher results than other methods on certain types of material, notably cereals and cereal products. An improved method recently developed[11] for determining riboflavin in cereal products and other materials places emphasis on (1) hydrolysis of the assay material sufficiently drastic to break up various combined forms of riboflavin, and (2) the removal of interfering substances by careful filtration or ether extraction. The results thus obtained raise the question of the accuracy of riboflavin values previously obtained by the original microbiological method. According to the investigators, if based on samples of relatively high potency, the older values probably are substantially correct while those obtained on cereals, composited diets, and certain animal feeds by the direct method are very likely too high.

Continuing interest is also observed in investigations of varietal differences in composition of fruits and vegetables at different stages of development and seasons of the year, and the effect of various methods of preparation and processing on nutritive values. Of particular interest to dietitians are studies on the comparative nutritive values of plain white, enriched white, and whole wheat breads made with and without 6 per cent dry skim milk; the effect of sharp freezing on the ascorbic acid content of vegetables; of defrosting at different temperatures and varying lengths of time; the difference in ascorbic acid content of tomatoes canned in tin and in glass; and other practical details such as the effect of washing strawberries before and after hulling, of soaking potatoes in fresh or salt water before boiling and of expressing tomato juice for canning while hot or cold.

The contributions of the following members of the American Dietetic Association to this compilation are acknowledged: J. Ernestine Becker, Eva G. Donelson, Jeanette Owens, Sybil Smith, Lillian B. Storms, Alice Strickler, and E. Neige Todhunter.

In the following, values given are for 100 gm. food except where indicated by an asterisk, in which case values given are for 100 milliliters. Values for cooked or otherwise processed foods are given for the solid portion only. For percentage losses in cooking or for composition of cooking water the original article must be consulted. A range of values is indicated thus: 0.34 to 0.84. More than one value reported separately is indicated thus: 3.4; 4.7. Superior figures refer to original sources of stated values (*see* references at end of table).

I. CEREALS AND CEREAL PRODUCTS

Cereals	
Barley	Thiamin 0.491 to 0.652 mg.[1]
	Riboflavin 0.16[11]; 0.078 to 0.114 mg.[1]
	Niacin 6.0 to 8.1[53]; 6.90 to 9.81 mg.[1]
	Pantothenic Acid 0.286 to 0.620 mg.[1]
	Choline 13.9 mg.[2]
Same, malted, dried	Thiamin 0.429 to 0.594 mg.[1]
	Riboflavin 0.276 to 0.352 mg.[1]
	Niacin 8.21 to 10.54 mg.[1]
	Pantothenic Acid 0.463 to 0.830 mg.[1]
Corn	Choline 21 mg.[46]
Corn, yellow	Riboflavin 0.13 mg.[11]
	Niacin 1.7 to 2.8 mg.[53]
	Choline 37.0 mg.[2]
Corn germ, raw stock	Choline 160.0 mg.[2]
Corn meal, bolted	Choline 10.0 mg.[2]
Same, unbolted	Choline 42.0 mg.[2]
Corn meal	P-aminobenzoic Acid 0.03 mg.[3]
Oats	Riboflavin 0.17 mg.[11]
	Niacin 1.8 to 2.1 mg.[53]
	Choline 94.0[2]; 42.0 mg.[46]
Oats, rolled	Choline 151.0 mg.[2]
	P-aminobenzoic Acid 0.033 mg.[3]
Rice, rough (Paddy), "Supreme Blue Rose"	Thiamin 0.26 mg.[4]
Same, "Early Prolific"	Thiamin 0.30 mg.[4]
Same, "Fortuna"	Thiamin 0.279 mg.[4]
Same, "Lady Wright"	Thiamin 0.30 mg.[4]
Same, "Improved Blue Rose"	Thiamin 0.307 mg.[4]
Rice, whole brown, "Supreme Blue Rose"	Thiamin 0.258 mg.[4]
Same, "Early Prolific"	Thiamin 0.317 mg.[4]
Same, "Fortuna"	Thiamin 0.305 mg.[4]
Same, "Lady Wright"	Thiamin 0.30 mg.[4]
Same, "Improved Blue Rose"	Thiamin 0.30 mg.[4]
Rice, polished	Niacin 1.2 mg.[53]
	Choline 8.80 mg.[2]
Rice, polished, (Head), "Supreme Blue Rose"	Thiamin 0.074 mg.[4]
Same, "Early Prolific"	Thiamin 0.059 mg.[4]
Same, "Fortuna"	Thiamin 0.054 mg.[4]
Same, "Lady Wright"	Thiamin 0.049 mg.[4]
Same, "Improved Blue Rose"	Thiamin 0.063 mg.[4]
Rice, hulls, "Supreme Blue Rose"	Thiamin 0.123 mg.[4]
Same, "Early Prolific"	Thiamin 0.11 mg.[4]
Same, "Fortuna"	Thiamin 0.093 mg.[4]
Same, "Lady Wright"	Thiamin 0.133 mg.[4]
Same, "Improved Blue Rose"	Thiamin 0.100 mg.[4]
Rice, bran, first break, "Supreme Blue Rose"	Thiamin 3.30 mg.[4]
Same, "Early Prolific"	Thiamin 2.99 mg.[4]
Same, "Fortuna"	Thiamin 2.15 mg.[4]
Same, "Lady Wright"	Thiamin 2.66 mg.[4]
Same, "Improved Blue Rose"	Thiamin 2.05 mg.[4]
Rice, polishings, "Supreme Blue Rose"	Thiamin 2.65 to 2.79 mg.[4]
Same, "Early Prolific"	Thiamin 2.23 to 2.26 mg.[4]
Same, "Fortuna"	Thiamin 1.50 mg.[4]
Same, "Lady Wright"	Thiamin 1.94 mg.[4]
Same, "Improved Blue Rose"	Thiamin 1.64 to 2.08 mg.[4]

Rice, polishings	Choline 126.0 mg.[3]
Same, "Labco"	P-aminobenzoic Acid 0.295 mg.[58]
Rice, wild, (*Zizania Aquatica*)	Thiamin 0.293 to 0.600 mg.[5]
	Riboflavin 0.542 to 1.058 mg.[5]
	Niacin 5.48 to 6.69 mg.[5]
	Pantothenic Acid 0.42 to 1.67 mg.[5]
Rye	Niacin 1.7 to 2.2 mg.[53]
Wheat	Thiamin 0.458 to 0.664 mg.[1]
	Riboflavin 0.071 to 0.112 mg.[1]
	Niacin 4.93 to 6.61[1]; 6.0 to 9.6[53]; 4.7 to 10.6 mg.[6]
	Pantothenic Acid 0.691 to 0.944 mg.[1]
	Choline 32 mg.[46]
Same, malted, dried	Thiamin 0.449 to 0.585 mg.[1]
	Riboflavin 0.227 to 0.367 mg.[1]
	Niacin 6.15 to 7.19 mg.[1]
	Pantothenic Acid 0.792 to 0.982 mg.[1]
	Choline 92.0 mg.[3]
Wheat bran	Riboflavin 0.36 mg.[11]
	Niacin 24.2 to 27.9 mg.[53]
	Choline 14.3[3]; 45 mg.[46]
Wheat germ, raw	Choline 410 to 403 mg.[2]
	Niacin 5.2[53]; 3.4 mg.[6]
	P-aminobenzoic Acid 0.1 mg.[3]
Wheat germ, defatted	Choline 423 mg.[2]
"Wheatena"	Choline 62.0 mg.[2]
Flour	
White	Thiamin 0.08 mg.[7]
	Riboflavin 0.033[7]; 0.038 mg.[59]
	Niacin 0.8 mg.[7]
	Pantothenic Acid 0.55 mg.[7]
	Pyridoxine 0.25 mg.[7]
	Iron 0.66[7]; 0.75 mg.[61]
	Choline 52.0 mg.[2]
White, patent	Niacin 1.0 mg.[5]
	Manganese 0.4 mg.[5]
Whole wheat	Thiamin 0.48 mg.[7]
	Riboflavin 0.13[11] to 0.11[7]; 0.092 mg.[59]
	Niacin 5.51 mg.[7]
	Pantothenic Acid 1.43 mg.[7]
	Pyridoxine 0.48 mg.[7]
	Iron 4.00[7]; 4.3 mg.[61]
	Manganese 3.5 to 4.0 mg.[5]
"Peeled" wheat	Thiamin 0.583 mg.[10]
	Pantothenic Acid 0.96 mg.[10]
	Inositol 110.5 mg.[10]
Bread	
White, plain	Thiamin 0.086 mg.[9]
	Pantothenic Acid 0.28 mg.[10]
	Manganese 0.22 to 0.33 mg.[5]
Same, toasted 30 seconds	Thiamin 0.078 mg.[9]
Same, toasted 70 seconds	Thiamin 0.059 mg.[9]
White, enriched	Thiamin 0.276 mg.[9]
Same, toasted 30 seconds	Thiamin 0.262 mg.[9]
Same, toasted 70 seconds	Thiamin 0.229 mg.[9]
White, enriched with fortified yeast	Calcium 0.048 gm.[60]
	Phosphorus 0.062 gm.[60]
	Iron 5.1 mg.[60]
	Thiamin 0.42 mg.[60]
	Riboflavin 0.07 mg.[60]
	Niacin 0.33 mg.[60]
Same, with added calcium and riboflavin	Calcium 0.126 gm.[60]
	Phosphorus 0.179 gm.[60]
	Iron 6.6 mg.[60]
	Thiamin 0.41 mg.[60]
	Riboflavin 0.15 mg.[60]
	Niacin 0.22 mg.[60]
White, made with 6% dry skim milk	Calcium 0.120; 0.121 gm.[60]
	Phosphorus 0.150; 0.166 gm.[60]
	Iron 1.5; 4.6 mg.[60]
	Thiamin 0.087; 0.11 mg.[60]
	Riboflavin 0.13; 0.17 mg.[60]
	Niacin 0.13; 0.10 mg.[60]
Same, enriched with fortified yeast	Calcium 0.122; 0.122 gm.[60]
	Phosphorus 0.170; 0.176 gm.[60]
	Iron 8.4; 8.0 mg.[60]
	Thiamin 0.38; 0.35 mg.[60]
	Riboflavin 0.16; 0.17 mg.[60]
	Niacin 0.28; 0.24 mg.[60]
Whole wheat, plain	Calcium 0.064; 0.061 gm.[60]
	Phosphorus 0.383; 0.398 gm.[60]
	Iron 6.1; 4.0 mg.[60]
	Thiamin 0.336[9]; 0.36; 0.30 mg.[60]
	Riboflavin 0.17; 0.14 mg.[60]
	Niacin 0.39; 0.37 mg.[60]
	Pantothenic Acid 0.46 mg.[10]
Same, toasted 30 seconds	Thiamin 0.322 mg.[9]
Same, toasted 70 seconds	Thiamin 0.265 mg.[9]
Whole wheat, made with 6% dry skim milk	Calcium 0.126 gm.[60]
	Phosphorus 0.422 gm.[60]
	Iron 4.2 mg.[60]
	Thiamin 0.31 mg.[60]
	Riboflavin 0.21 mg.[60]
	Niacin 0.39 mg.[60]
"Peeled" wheat, plain	Thiamin 0.296 mg.[10]
	Riboflavin 0.245 mg.[10]
	Niacin 3.5 mg.[10]
	Pantothenic Acid 0.52 mg.[10]
	Pyridoxine 0.314 mg.[10]
	Inositol 64.4 mg.[10]
Same, made with high-vitamin yeast	Thiamin 0.464 mg.[10]
	Niacin 4.44 mg.[10]
	Pantothenic Acid 0.49 mg.[10]
	Inositol 36.5 mg.[10]

II. FRUITS (including Fruit Juices)

Apples, raw	Niacin 0.091 mg.[12]
Apples, "Delicious," raw	Ascorbic Acid 1.96 to 4.50 mg.[39]
	Thiamin 0.013 mg.[39]
	Riboflavin 0.010 mg.[39]
	Niacin 0.050 mg.[39]
	Pyridoxine 0.035 mg.[39]
	Pantothenic Acid 0.055 mg.[39]
	Inositol 6.9 mg.[39]
	Biotin 0.0008 mg.[39]
	P-aminobenzoic Acid 0.022 mg.[39]
Same, stored 2 months	Ascorbic Acid 1.52 to 2.40 mg.[39]
Apples, "Grimes," raw	Ascorbic Acid 2.59 to 3.33 mg.[39]
	Thiamin 0.010 mg.[39]
	Riboflavin 0.012 mg.[39]
	Niacin 0.072 mg.[39]
	Pyridoxine 0.043 mg.[39]
	Pantothenic Acid 0.065 mg.[39]
	Inositol 39.0 mg.[39]
	Biotin 0.0013 mg.[39]
	P-aminobenzoic Acid 0.038 mg.[39]
Same, stored 2 months	Ascorbic Acid 2.10 to 2.36 mg.[39]
Apples, "Rome," raw	Ascorbic Acid 2.93 mg.[39]
	Thiamin 0.013 mg.[39]
	Riboflavin 0.010 mg.[39]
	Niacin 0.062 mg.[39]
	Pyridoxine 0.031 mg.[39]
	Pantothenic Acid 0.065 mg.[39]
	Inositol 25.7 mg.[39]
	Biotin 0.0009 mg.[39]
	P-aminobenzoic Acid 0.026 mg.[39]
Same, stored 2 months	Ascorbic Acid 2.33 mg.[39]
Apples, "Starking," raw	Ascorbic Acid 2.59 mg.[39]
Same, stored 2 months	Ascorbic Acid 1.52 mg.[39]
Apples, "Stayman," raw	Ascorbic Acid 3.74 mg.[39]
	Thiamin 0.011 mg.[39]
	Riboflavin 0.008 mg.[39]
	Niacin 0.067 mg.[39]
	Pyridoxine 0.037 mg.[39]
	Pantothenic Acid 0.070 mg.[39]
	Inositol 7.7 mg.[39]
	Biotin 0.0011 mg.[39]
	P-aminobenzoic Acid 0.031 mg.[39]
Same, stored 2 months	Ascorbic Acid 2.80 mg.[39]
Apples, "York," raw	Ascorbic Acid 1.70 mg.[39]
	Thiamin 0.010 mg.[39]
	Riboflavin 0.011 mg.[39]
	Niacin 0.074 mg.[39]
	Pyridoxine 0.041 mg.[39]
	Pantothenic Acid 0.070 mg.[39]
	Inositol 11.9 mg.[39]
	Biotin 0.0014 mg.[39]
	P-aminobenzoic Acid 0.032 mg.[39]
Same, stored 2 months	Ascorbic Acid 1.50 mg.[39]
Apricots, raw	Potassium 0.408 to 0.432 mg.[13]
Avocado, raw	Niacin 0.927; 0.973; 1.02 mg.[12]
Bananas, raw	Niacin 0.464; 0.573; 0.600 mg.[12]

Bananas, dehydrated	Ascorbic Acid 3.3 mg.[24]
Blackberries, raw	Ascorbic Acid 15 mg.[22]
Blackberries, "Early Wonder," raw	Ascorbic Acid 23.5 mg.[14]
Blackberries, "Brainerd," ripe	Ascorbic Acid 12.9 mg.[14]
Same, red stage	Ascorbic Acid 11.6 mg.[14]
Blueberries, "Cabot," raw	Ascorbic Acid 18.6 mg.[14]
Blueberries, "Concord," raw	Ascorbic Acid 16.0 mg.[14]
Blueberries, "Rancocas," raw	Ascorbic Acid 18.4 mg.[14]
Blueberries, "Scammell," raw	Ascorbic Acid 16.5 mg.[14]
Same, green	Ascorbic Acid 3.3 mg.[14]
Buffalo-berries, raw	Ascorbic Acid 150 to 180 mg.[15]
Cherries, raw	Niacin 0.127; 0.145 mg.[12]
Dewberries, "Young," raw	Ascorbic Acid 32.5 mg.[14]
Dewberries, "Boysen," raw	Ascorbic Acid 15[22]; 25.9 mg.[14]
Dewberries, "Lucretia," raw	Ascorbic Acid 27.0 mg.[14]
Grapefruit, dried, sliced	Ascorbic Acid 153.0 mg.[16]
Lemons, raw	Niacin 0.154; 0.190 mg.[12]
Limes, raw	Niacin 0.227; 0.275 mg.[12]
Loganberries, raw	Ascorbic acid 15 mg.[22]
Oranges, raw	Niacin 0.173; 0.209; 0.218 mg.[12]
Oranges, whole, including peel, raw	Ascorbic Acid 58 to 109 mg.[18]
Orange pulp (skin enclosing segments with some inner white skin), raw	Ascorbic Acid 42 to 64 mg.[18]
Orange peel, whole, raw	Ascorbic Acid 101 to 227 mg.[18]
Same, minced	Ascorbic Acid 211 mg.[18]
Same, minced, then allowed to stand 3 hours	Ascorbic Acid 46 mg.[18]
Same, minced, then allowed to stand 22 hours	Ascorbic Acid 14 mg.[18]
Oranges, dried, then sliced	Ascorbic Acid 347 mg.[16]
Peaches, "Early Wheeler," raw, ripe	Ascorbic Acid 7.36 mg.[19]
Same, soft stage	Ascorbic Acid 8.28 mg.[19]
Peaches, "Golden Jubilee," raw, ripe	Ascorbic Acid 6.13 mg.[19]
Same, soft stage	Ascorbic Acid 7.71 mg.[19]
Peaches, "Elberta," raw, ripe	Ascorbic Acid 5.25 mg.[19]
Peaches, "Hiley Belle," raw, ripe	Ascorbic Acid 12.86 mg.[19]
Same, soft stage	Ascorbic Acid 14.05 mg.[19]
Peaches, "Mayflower," raw, ripe	Ascorbic Acid 5.34 mg.[19]
Same, soft stage	Ascorbic Acid 5.57 mg.[19]
Peaches, "Early Rose," raw, ripe	Ascorbic Acid 7.18 mg.[19]
Peaches, "Carman," raw, ripe	Ascorbic Acid 8.82 mg.[19]
Same, soft stage	Ascorbic Acid 10.53 mg.[19]
Peaches, "Augbert," raw, ripe	Ascorbic Acid 3.84 mg.[19]
Persimmons, "Early Golden," raw, green	Ascorbic Acid 300 mg.[20]
Same, ripe	Ascorbic Acid 105 mg.[20]
Persimmons, "Silkeline," raw, green	Ascorbic Acid 380 mg.[20]
Same, ripe	Ascorbic Acid 95 mg.[20]
Persimmons, "Miller," raw, green	Ascorbic Acid 250 mg.[20]
Persimmons, "Ruby," raw, green	Ascorbic Acid 370 mg.[20]
Persimmons, wild, raw, green	Ascorbic Acid 210; 250 mg.[20]
Raisins, dehydrated, "Thompson Seedless"	Calcium 0.050 to 0.063 gm.[21] Magnesium 0.018 to 0.033 gm.[21] Phosphorus 0.097 to 0.115 gm.[21] Potassium 0.852 to 0.946 gm.[21]
Same, "Muscat of Alexandria"	Calcium 0.059 to 0.077 gm.[21] Magnesium 0.017 to 0.030 gm.[21] Phosphorus 0.082 to 0.101 gm.[21] Potassium 0.652 to 0.796 gm.[21]
Raisins, sun-dried, "Thompson Seedless"	Calcium 0.050 to 0.072 gm.[21] Magnesium 0.021 to 0.035 gm.[21] Phosphorus 0.095 to 0.114 gm.[21] Potassium 0.864 to 0.973 gm.[21]
Same, "Muscat of Alexandria"	Calcium 0.061 to 0.076 gm.[21] Magnesium 0.019 to 0.033 gm.[21] Phosphorus 0.087 to 0.100 gm.[21] Potassium 0.670 to 0.794 gm.[21]
Raspberries, raw	Ascorbic Acid 25 mg.[22]
Same, quick-frozen, crushed	Ascorbic Acid 20.9 to 21.9 mg.[22]
Raspberries, "Dixie," raw	Ascorbic Acid 32.5 mg.[14]
Raspberries, "Latham," raw	Ascorbic Acid 23.5 mg.[14]
Raspberries, "Newburgh," raw	Ascorbic Acid 20.5 mg.[14]
Strawberries, raw	Niacin 0.227; 0.264 mg.[12]
Strawberries, "Dunlap," raw, 1940 crop	Ascorbic Acid 65 to 89 mg.[34]
Same, 1941 crop	Ascorbic Acid 52 to 86 mg.[34]
Strawberries, "Dunlap," raw	Ascorbic Acid 79 mg.[34]
Same, stored 1 day at 75°F.	Ascorbic Acid 72 mg.[34]
Same, stored 2 days at 75°F.	Ascorbic Acid 71 mg.[34]
Same, stored in hydrator pan in refrigerator 1 day at 40°F	Ascorbic Acid 82 mg.[34]
Same, stored in hydrator pan in refrigerator 2 days at 40°F	Ascorbic Acid 85 mg.[34]
Same, stored in hydrator pan in refrigerator 3 days at 40°F	Ascorbic Acid 70 mg.[34]
Same, stored in hydrator pan in refrigerator 4 days at 40°F	Ascorbic Acid 75 mg.[34]
Same, stored in hydrator pan in refrigerator 5 days at 40°F	Ascorbic Acid 75 mg.[34]
Strawberries, "Dunlap," raw, washed before hulling	Ascorbic Acid 64 mg.[34]
Same, washed after hulling	Ascorbic Acid 51 mg.[34]
Strawberries, "Dunlap," sliced, raw, no sugar added	Ascorbic Acid 64 mg.[34]
Same, after standing 30 minutes at 75°F.	Ascorbic Acid 60 mg.[34]
Strawberries, "Dunlap," sliced, raw, sugar added	Ascorbic Acid 64 mg.[34]
Same, after standing 30 minutes at 75°F.	Ascorbic Acid 63 mg.[34]
Strawberries, "Dunlap," quick-frozen in dry-sugar pack (1 to 4) raw sugared berry before freezing	Ascorbic Acid 51 mg.[34]
Same, frozen 0 to 14 days	Ascorbic Acid 46 mg.[34]
Same, frozen 2 months	Ascorbic Acid 28 mg.[34]
Same, frozen 4 months	Ascorbic Acid 21 mg.[34]
Same, frozen 6 months	Ascorbic Acid 14 mg.[34]
Strawberries, "Dunlap," quick-frozen in 65% sugar syrup, raw, frozen 1 to 14 days	Ascorbic Acid 57 mg.[34]
Same, frozen 2 months	Ascorbic Acid 18 mg.[34]
Same, frozen 4 months	Ascorbic Acid 14 mg.[34]
Same, frozen 6 months	Ascorbic Acid 11 mg.[34]
Strawberries, "Dunlap," canned, stored 1 to 14 days	Ascorbic Acid 25 mg.[34]
Same, stored 3 months	Ascorbic Acid 18 mg.[34]
Same, stored 6 months	Ascorbic Acid 17 mg.[34]
Same, stored 9 months	Ascorbic Acid 9 mg.[34]
Strawberries, "Gem Everbearing," raw, 1941 first crop, height of bearing period	Ascorbic Acid 80 mg.[34]
Same, end of bearing period.	Ascorbic Acid 67 mg.[34]
Strawberries, "Gem Everbearing," raw, 1941 second crop	Ascorbic Acid 61 mg.[34]
Strawberries, "Gem Everbearing," raw, stored 1 day at 75°F.	Ascorbic Acid 67 mg.[34]
Same, stored 2 days at 75°F.	Ascorbic Acid 78 mg.[34]
Strawberries, "Gem Everbearing," raw, stored in hydrator pan in refrigerator 1 day at 40° F.	Ascorbic Acid 67 mg.[34]
Same, stored 2 days	Ascorbic Acid 66 mg.[34]
Same, stored 3 days	Ascorbic Acid 66 mg.[34]
Same, stored 5 days	Ascorbic Acid 68 mg.[34]
Strawberries, "Gem, Everbearing," raw, washed before hulling	Ascorbic Acid 67 mg.[34]
Same, washed after hulling.	Ascorbic Acid 69 mg.[34]
Strawberries, "Gem Everbearing," sliced, raw, no sugar added	Ascorbic Acid 67 mg.[34]
Same, after standing 30 minutes at 75°F.	Ascorbic Acid 63 mg.[34]

Strawberries, "Gem Everbearing," first crop, quick-frozen in dry-sugar pack (1 to 4) raw sugared berry before freezing	Ascorbic Acid 64 mg.[34]
Same, frozen 1 to 14 days	Ascorbic Acid 54 mg.[34]
Same, frozen 2 months	Ascorbic Acid 29 mg.[34]
Same, frozen 4 months	Ascorbic Acid 18 mg.[34]
Same, frozen 6 months	Ascorbic Acid 18 mg.[34]
Strawberries, "Gem Everbearing," second crop, quick-frozen in dry-sugar pack (1 to 4) raw sugared berry before freezing	Ascorbic Acid 49 mg.[34]
Same, frozen 1 to 14 days	Ascorbic Acid 39 mg.[34]
Same, frozen 2 months	Ascorbic Acid 23 mg.[34]
Same, frozen 4 months	Ascorbic Acid 23 mg.[34]
Strawberries, "Gem Everbearing," first crop, quick-frozen in 65% sugar syrup, raw, frozen 1 to 14 days	Ascorbic Acid 48 mg.[34]
Same, frozen 2 months	Ascorbic Acid 21 mg.[34]
Same, frozen 4 months	Ascorbic Acid 19 mg.[34]
Same, frozen 6 months	Ascorbic Acid 12 mg.[34]
Strawberries, "Gem Everbearing," second crop, quick-frozen in 65% sugar syrup, raw, frozen 1 to 14 days	Ascorbic Acid 36 mg.[34]
Same, frozen 2 months	Ascorbic Acid 17 mg.[34]
Same, frozen 4 months	Ascorbic Acid 20 mg.[34]
Strawberries, "Gem Everbearing," canned, stored 1 to 14 days	Ascorbic Acid 26 mg.[34]
Same, stored 3 months	Ascorbic Acid 18 mg.[34]
Same, stored 6 months	Ascorbic Acid 14 mg.[34]
Same, stored 9 months	Ascorbic Acid 10 mg.[34]
Apricot juice	Potassium 0.174 gm.[13]
Apricot juice, canned	Niacin 0.136 mg.[12]
Currant juice, fresh	Potassium 0.107 gm.[13]
Grapefruit juice, fresh	Riboflavin 0.3 mg.[11] Ascorbic Acid 41.2 mg.[58]
Grapefruit juice, canned	Ascorbic Acid 41[24]; *33.7 mg.[58] Niacin 0.136 to 0.154 mg.[12]
Orange juice	Ascorbic Acid 48 mg.[24*]
Orange juice, strained, expressed from oranges purchased in March	Ascorbic Acid 45 to 59 mg.[17*]
Same, from oranges purchased in June	Ascorbic Acid 27 to 64 mg.[17*]
Same, from oranges purchased in September	Ascorbic Acid 32 to 46 mg.[17*]
Same, from oranges purchased in December	Ascorbic Acid 40 to 67 mg.[17*]
Orange juice, canned	Niacin 0.145; 0.154; 0.164 mg.[12]
Papaya juice, canned	Niacin 0.091 mg.[12*]
Peach juice, canned	Niacin 0.300 mg.[12]
Pear juice, canned	Niacin 0.091 mg.[12]
Pineapple juice, canned	Potassium 0.074 gm.[13] Ascorbic Acid 35 mg.[24*] Niacin 0.136 mg.[12]
Plum juice, canned	Niacin 0.118 mg.[12]
Prune juice, canned	Niacin 0.390; 0.427; 0.455 mg.[12]
Raspberry juice, fresh	Potassium 0.071 gm.[13]
Tomato juice, raw	Ascorbic Acid 18 mg.[24] Riboflavin 0.03 mg.[11]
Tomato juice, commercially-canned	Ascorbic Acid 14.0 to 21.0 mg.[51*] Niacin 0.510; 0.555; 0.564 mg.[12]
Tomato juice, home-canned	Ascorbic Acid 18.5 to 34.3 mg.[23*]
Tomato juice, home-canned in tin, stored 1 to 2 days	Ascorbic Acid 19.7 mg.[35*]
Same, stored 2 to 3 days	Ascorbic Acid 19.9 mg.[35*]
Same, stored 2½ months	Ascorbic Acid 19.6 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 19.2 mg.[35*]
Same, stored 8½ months	Ascorbic Acid 16.4 mg.[35*]
Tomato juice, home-canned in glass, stored 1 to 2 days	Ascorbic Acid 19.0 mg.[35*]
Same, stored 2 to 3 days	Ascorbic Acid 19.2 mg.[35*]
Same, stored 2½ months	Ascorbic Acid 15.8 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 15.0 mg.[35*]
Same, stored 8½ months	Ascorbic Acid 5.7 mg.[35*]
Tomato juice, home-canned in glass, with "tin insert," stored 1 to 2 days	Ascorbic Acid 19.1 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 19.4 mg.[35*]
Same, stored 8½ months	Ascorbic Acid 15.9 mg.[35*]
Tomato juice, home-canned in enamel-lined tin, stored 1 to 2 days	Ascorbic Acid 17.7 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 16.4 mg.[35*]
Same, stored 8½ months	Ascorbic Acid 14.0 mg.[35*]
Tomato juice, home-canned in tin, no head space, stored 1 to 2 days	Ascorbic Acid 19.4 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 19.0 mg.[35*]
Tomato juice, home-canned in tin, with head space, stored 1 to 2 days	Ascorbic Acid 18.2 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 18.5 mg.[35*]
Tomato juice, home-canned in glass, no head space, stored 1 to 2 days	Ascorbic Acid 18.8 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 14.0 mg.[35*]
Tomato juice, home-canned in glass, with head space, stored 1 to 2 days	Ascorbic Acid 17.8 mg.[35*]
Same, stored 3½ months	Ascorbic Acid 14.7 mg.[35*]
Tomato juice, home-canned, expressed cold	Ascorbic Acid 18.7 mg.[35*]
Same, pulp heated to soften, expressed hot	Ascorbic Acid 21.8 mg.[35*]
Same, pulp heated to soften, cooled, then pressed	Ascorbic Acid 20.6 mg.[35*]

III. VEGETABLES (including Vegetable Juices)

Asparagus, raw	Niacin 1.2; 1.16; 1.1 mg.[12] Choline 128 mg.[2]
Same, beginning of processing season	Thiamin 0.183 mg.[44]
Same, end of processing season	Thiamin 0.174 mg.[44]
Same, boiled	Niacin 1.1; 1.07; 0.96 mg.[12]
Asparagus, quick-frozen, raw	Thiamin 0.211[28]; 0.152; 0.146; 0.158 mg.[44]
Same, stored 7 months at 10°F	Thiamin 0.168 mg.[44]
Same, stored 7 months at −8°F	Thiamin 0.157 mg.[44]
Same, stored 7 months at −40°F	Thiamin 0.152 mg.[44]
Beans, black turtle, dried	Niacin 1.573; 1.325 mg.[12]
Same, boiled	Niacin 0.500; 0.455 mg.[12]
Beans, green, raw	Niacin 0.352; 0.355; 0.345 mg.[12]
Same, boiled	Niacin 0.182; 0.264; 0.280 mg.[12]
Beans, green, canned	Niacin 0.200; 0.163; 0.227 mg.[12]
Beans, kidney, dried	Niacin 1.909; 1.709; 1.709 mg.[12]
Same, boiled	Niacin 0.655; 0.500; 0.563 mg.[12]
Beans, Lima, raw	Niacin 1.073; 0.845; 0.845 mg.[12]
Same, boiled	Niacin 1.000; 0.618; 0.720 mg.[12]
Same, canned	Niacin 0.327; 0.436; 0.280 mg.[12]
Beans, Lima, quick-frozen, raw	Thiamin 0.117 mg.[25]
Beans, Lima, dried	Niacin 1.518; 1.309; 1.273 mg.[12]
Same, boiled	Niacin 0.510; 0.400; 0.418 mg.[12]
Beans, navy, dried	Niacin 1.854; 1.490; 1.663 mg.[12]
Same, boiled	Niacin 0.720; 0.455; 0.573 mg.[12]
Beans, navy (*Phaseolus vulgaris*, "Michigan bean"), baked	Thiamin 0.237 mg.[26]
Beans, snap, raw	Choline 340 mg.[2]
Beans, snap, quick-frozen, raw	Thiamin 0.076 mg.[25]
Beans, string, raw	Ascorbic Acid 23 mg.[24]
Beans, yellow eye, dried	Niacin 1.800; 1.490 mg.[12]
Same, boiled	Niacin 0.464; 0.525 mg.[12]
Beets, peeled, raw	Niacin 0.127; 0.164; 0.227 mg.[12]
Same, boiled	Niacin 0.091; 0.127; 0.164 mg.[12]
Beet greens, raw	Niacin 0.290; 0.327 mg.[12]
Same, boiled	Niacin 0.355; 0.364 mg.[12]
Broccoli, raw	Calcium 0.068 gm.[28] Phosphorus 0.054 gm.[28] Iron 0.84 mg.[28] Carotene 0.86 mg.[28] Thiamin 0.086 mg.[28] Riboflavin 0.320 mg.[28] Niacin 0.835; 1.050; 0.790[12]; 0.91 mg.[28] Ascorbic Acid 95 mg.[28]
Same, steamed with very small amount of water in tightly covered saucepan (method of electric cookery)	Calcium 0.057 mg.[21]

Same (*see* preceding page).	Phosphorus 0.048 mg.[28] Iron 0.84 mg.[28] Carotene 0.93 mg.[28] Thiamin 0.085 mg.[28] Riboflavin 0.243 mg.[28] Niacin 0.33 mg.[28] Ascorbic Acid 66 mg.[28]
Same, added to large amount of cold, distilled water, brought to a boil, then simmered until done	Calcium 0.047 mg.[28] Phosphorus 0.038 mg.[28] Iron 0.84 mg.[28] Carotene 0.92 mg.[28] Thiamin 0.047 mg.[28] Riboflavin 0.195 mg.[28] Niacin 0.32 mg.[28] Ascorbic Acid 43 mg.[28]
Same, boiled	Niacin 0.773; 0.573; 0.455 mg.[12]
Broccoli, quick-frozen, raw	Thiamin 0.106 mg.[25]
Broccoli, "Italian Green Sprouting," quick-frozen, raw, yellow-green bud	Ascorbic Acid 49 mg.[36]
Same, dark green bud	Ascorbic Acid 67 mg.[36]
Same, small dark green stem	Ascorbic Acid 122 mg.[36]
Same, large light green stem	Ascorbic Acid 89 mg.[36]
Same, medium size, medium green stem	Ascorbic Acid 100 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 97 mg.[36]
Same, defrosted 1½ hours at 78°F	Ascorbic Acid 97 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 85 mg.[36]
Same, defrosted 4 hours at 40°F	Ascorbic Acid 86 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 95 mg.[36]
Same, defrosted 16 hours at 40°F	Ascorbic Acid 89 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 85 to 91 mg.[36]
Same, boiled in 100 gm. water	Ascorbic Acid 76 mg.[36]
Same, boiled in 500 gm. water	Ascorbic Acid 48 to 55 mg.[36]
Same, boiled in 1000 gm. water	Ascorbic Acid 48 mg.[36]
Same, boiled in 500 gm. water, 11 min. (overdone)	Ascorbic Acid 55 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 84 to 88 mg.[36]
Same, steamed	Ascorbic Acid 72 to 80 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, raw	Ascorbic Acid 94 to 95 mg.[36]
Same, cooked in pressure saucepan	Ascorbic Acid 53 to 55 mg.[36]
Broccoli, "Italian Green Sprouting," quick-frozen, boiled	Ascorbic Acid 77 mg.[36]
Same, stored 24 hours at 40°F	Ascorbic Acid 62 mg.[36]
Same, stored 48 hours at 40°F	Ascorbic Acid 51 mg.[36]
Cabbage, raw	Niacin 0.118; 0.264; 0.264 mg.[12] Ascorbic Acid 23.1 to 55.8 mg.[22]
Same, boiled	Niacin 0.109; 0.218; 0.200 mg.[12]
Cabbage, boiled	Ascorbic Acid 12.0 mg.[30]
Same, kept hot for 60 minutes	Ascorbic Acid 5.6 mg.[30]
Cabbage, young, raw	Choline 251.0 mg.[2]
Cabbage, "Danish Ballhead," raw	Ascorbic Acid 36.3 to 55.8 mg.[23]
Same, held one week in automatic refrigerator	Ascorbic Acid 23.0 mg.[23]
Cabbage, dried	P-aminobenzoic Acid 0.97 mg.[50]
Carrots, raw	Calcium 0.041 gm.[28] Phosphorus 0.018 gm.[28] Iron 0.39 mg.[28] Carotene 9.68 mg.[28] Niacin 0.72 mg.[28] Choline 95 mg.[2]
Same, steamed in very small amount of water in tightly covered saucepan (method of electric cookery)	Calcium 0.044 gm.[28] Phosphorus 0.021 gm.[28] Iron 0.41 mg.[28] Carotene 10.0 mg.[28] Niacin 0.77 mg.[28]
Same, added to large amount of cold, distilled water, brought to a boil, then simmered until done	Calcium 0.041 gm.[28] Phosphorus 0.018 gm.[28] Iron 0.36 mg.[28] Carotene 9.8 mg.[28] Niacin 0.55 mg.[28]
Carrots, scraped, raw	Niacin 0.327; 0.345; 0.200 mg.[12]
Same, boiled	Niacin 0.275; 0.275; 0.182 mg.[12]
Carrots, dried	P-aminobenzoic Acid 0.0178 mg.[50]
Cauliflower, raw	Niacin 0.663; 0.600; 0.482 mg.[12]
Same, boiled	Niacin 0.510; 0.410; 0.455 mg.[12]
Cauliflower, quick-frozen, raw	Thiamin 0.053 mg.[25]
Celery, raw	Niacin 0.264; 0.190; 0.182 mg.[12]
Corn, cut, quick-frozen, raw	Thiamin 0.120 mg.[25]
Cowpeas, raw	Choline 257 mg.[2]
Cress, raw, Australian (*Lepidium*)	Ascorbic Acid 148 mg.[27]
Same, American (*Barbarea verna*)	Ascorbic Acid 108 mg.[27]
Same, "Italian corn salad" (*Valerianella eriocarpa*)	Ascorbic Acid 93 mg.[27]
Same, "Nüsslisalat" Swiss, (*Valerianella olitoria*)	Ascorbic Acid 55; 84 mg.[27]
Same, Watercress, (*Nasturtium officinale*)	Ascorbic Acid 37; 54 mg.[27]
Cucumbers, raw	Calcium 0.0168 to 0.0315 gm.[56] Phosphorus 0.0249 to 0.0379 gm.[56] Iron 0.84 to 1.39 mg.[56] Copper 0.18 to 0.5 mg.[56] Vitamin A 166 to 290 I.U.[56] Vitamin B_1 7.0 to 20.0 I.U.[56] Vitamin B_2 25 to 90 S.B.U.[56] Vitamin C 234 to 293 I.U.[56]
Cucumbers, raw	Niacin 0.109; 0.136; 0.168 mg.[12]
Escarole, raw	Niacin 0.373 mg.[12]
Lettuce, head, raw	Niacin 0.100; 0.127; 0.200 mg.[12]
Mustard tops, raw	Choline 252.0 mg.[2]
Onions, raw	Niacin 0.182 mg.[13]
Peas, raw (average values of different lots, grown in different years), "World Record"	Thiamin 0.71 mg.[45]
Same, "Lord Chancellor"	Thiamin 0.70 mg.[45]
Same, "Dwarf Alderman"	Thiamin 0.67 mg.[45]
Same, "Rogers 95"	Thiamin 0.65 mg.[45]
Same, "Stratagem"	Thiamin 0.63 mg.[45]
Same, "Asgrow 40"	Thiamin 0.56 mg.[45]
Same, "Improved Gradus"	Thiamin 0.46 mg.[45]
Same, "Confidence"	Thiamin 0.43 mg.[45]
Same, "Extra Early Gradus"	Thiamin 0.39 mg.[45]
Same, "Tall Alderman"	Thiamin 0.38 mg.[45]
Same, "Glacier Park"	Thiamin 0.36 mg.[45]
Same, "Telephone"	Thiamin 0.33 mg.[45]
Same, "Glacier"	Thiamin 0.33 mg.[45]
Same, "Asgrow Glacier"	Thiamin 0.31 mg.[45]
Same, "Thomas Laxton"	Thiamin 0.30 mg.[45]
Same, "Gradus"	Thiamin 0.29 mg.[45]
Same, "Improved Stratagem"	Thiamin 0.27 mg.[45]
Same, "Onward"	Thiamin 0.26 mg.[45]
Same, "Laxton's Progress"	Thiamin 0.20 mg.[45]
Peas, "Thomas Laxton," raw	Thiamin 0.31 mg.[45]
Same, cooked	Thiamin 0.30 mg.[45]

Peas, raw	Calcium 0.022 gm.[28]
	Phosphorus 0.114 gm.[28]
	Iron 1.6 mg.[28]
	Carotene 0.765 mg.[28]
	Thiamin 0.48 mg.[28]
	Riboflavin 0.258 mg.[28]
	Niacin 1.79[28]; 1.48; 1.38; 1.82 mg.[12]
	Ascorbic Acid 32.1 mg.[28]
	Choline 263 mg.[2]
Same, steamed, with very small amount of water in tightly covered saucepan (method of electric cookery)	Calcium 0.023 mg.[28]
	Phosphorus 0.114 mg.[28]
	Iron 1.65 mg.[28]
	Carotene 0.72 mg.[28]
	Thiamin 0.47 mg.[28]
	Riboflavin 0.251 mg.[28]
	Niacin 1.82 mg.[28]
	Ascorbic Acid 28.7 mg.[28]
Same, added to large amount of cold, distilled water, brought to a boil then simmered until done	Calcium 0.021 gm.[28]
	Phosphorus 0.104 gm.[28]
	Iron 1.67 mg.[28]
	Carotene 0.63 mg.[28]
	Thiamin 0.26 mg.[28]
	Riboflavin 0.179 mg.[28]
	Niacin 1.15 mg.[28]
	Ascorbic Acid 21.8 mg.[28]
Same, boiled	Niacin 0.97; 0.93; 1.34 mg.[12]
Peas, raw	Thiamin 0.333 mg.[62]
Same, cooked in water	Thiamin 0.257 mg.[62]
Same, cooked with sodium bicarbonate	Thiamin 0.258 mg.[62]
Peas, canned	Niacin 0.582; 0.509; 0.763 mg.[12]
Peas, quick-frozen, raw	Thiamin 0.364[25]; 0.368 mg.[44]
Same, stored 5 months at 10°F.	Thiamin 0.368 mg.[44]
Same, stored 5 months at −8°F.	Thiamin 0.359 mg.[44]
Same, stored 5 months at −40°F.	Thiamin 0.368 mg.[44]
Peas, "Asgrow Glacier," raw	Thiamin 0.33 mg.[45]
Same, quick-frozen	Thiamin 0.31 mg.[45]
Peas, "Onward," raw	Thiamin 0.31 mg.[45]
Same, quick-frozen	Thiamin 0.26 mg.[45]
Peas, "Thomas Laxton" (beginning of processing season), raw	Thiamin 0.311 mg.[44]
Same, quick-frozen	Thiamin 0.283 mg.[44]
Peas, "Thomas Laxton," quick-frozen, raw	Thiamin 0.30 mg.[45]
Same, cooked	Thiamin 0.28 mg.[45]
Peas, "Telephone" (end of processing season), raw	Thiamin 0.433 mg.[44]
Same, quick-frozen	Thiamin 0.336 mg.[44]
Peas, quick-frozen, raw	Ascorbic Acid 351; 333 mg.[62]
Same, cooked in water	Ascorbic Acid 238; 257 mg.[62]
Same, cooked with sodium bicarbonate	Ascorbic Acid 193; 258 mg.[62]
Peas, quick-frozen, dry-packed, raw	Thiamin 0.39 mg.[45]
Same, cooked	Thiamin 0.33 mg.[45]
Peas, quick-frozen, brine-packed, raw	Thiamin 0.37 mg.[45]
Same, cooked	Thiamin 0.36 mg.[45]
Peas, split, dried	Niacin 2.536; 2.782; 2.164 mg.[12]
Same, boiled	Niacin 0.754; 0.800; 0.600 mg.[12]
Peppers, green, raw	Niacin 0.264; 0.300; 0.237 mg.[12]
Peppers, "Bell," raw, green	Carotene 0.32 to 0.39 mg.[29]
	Ascorbic Acid 248 mg.[29]
Same, red	Carotene 12.4 mg.[29]
Peppers, "Chili No. 9," raw, green	Carotene 0.32 to 0.73 mg.[29]
	Ascorbic Acid 53 to 404 mg.[29]
Same, partly ripe	Ascorbic Acid 248 to 351 mg.[29]
Same, red	Carotene 3.4 to 24.6 mg.[29]
	Ascorbic Acid 299 to 350 mg.[29]
Peppers, chili, "Anaheim," raw, green	Carotene 0.52; 0.61 mg.[29]
Same, partly ripe	Carotene 3.14 mg.[29]
Same, red	Carotene 10.7 to 12.1 mg.[29]
Peppers, chili, "Anaheim," raw, green (from local store)	Carotene 0.14 to 0.64 mg.[29]
	Ascorbic Acid 66 to 121 mg.[29]
Peppers, "White Casaba," raw, yellow	Carotene 0.09 mg.[29]
Same, green	Carotene 0.12 to 0.35 mg.[29]
Same, red	Carotene 4.1 to 4.3 mg.[29]
Peppers, paprika, "Florida," raw, green	Carotene 0.52 to 0.74 mg.[29]
	Ascorbic Acid 99 mg.[29]
Same, partly ripe	Carotene 1.8 to 2.5 mg.[29]
	Ascorbic Acid 251 mg.[29]
Same, red	Carotene 12.9 to 14.6 mg.[29]
	Ascorbic Acid 278 mg.[29]
Peppers, paprika, "Long Red," raw, green	Carotene 0.52; 0.58 mg.[29]
	Ascorbic Acid 115 mg.[29]
Same, partly ripe, green side	Ascorbic Acid 202 mg.[29]
Same, partly ripe, red side	Ascorbic Acid 261 mg.[29]
Same, red	Carotene 9.5 mg.[29]
	Ascorbic Acid 560 mg.[29]
Peppers, paprika, "Hungarian," raw, green	Carotene 0.37 to 0.47 mg.[29]
Same, red	Carotene 22.2 mg.[29]
Peppers, "Jubilee of Honor," raw, yellow	Carotene 0.014 to 0.032 mg.[29]
Same, orange	Carotene 0.11 to 0.13 mg.[29]
Peppers, chili, green, home-canned	Carotene 0.31 to 0.54 mg.[29]
	Ascorbic Acid 18 to 156 mg.[29]
Same, commercially-canned	Carotene 0.24 to 0.55 mg.[29]
	Ascorbic Acid 50 to 62 mg.[29]
Peppers, chili, green, dehydrator-dried	Carotene 3.46 to 2.03 mg.[52]
	Ascorbic Acid 0.35 to 1.66 mg.[52]
Same, sun-dried	Carotene 0.39 to 0.53 mg.[52]
	Ascorbic Acid 0.09 to 0.14 mg.[62]
Peppers, chili, red, dried	Carotene 17.6 to 102.0 mg.[29]
	Ascorbic Acid 81 to 212 mg.[29]
Same, dried, ground, then stored	Ascorbic Acid 12 mg.[29]
Pokeweed, raw	Choline 228 mg.[29]
Potatoes, raw	Calcium 0.0084 gm.[28]
	Phosphorus 0.047 gm.[28]
	Iron 0.60 mg.[28]
	Thiamin 0.17 mg.[28]
	Riboflavin 0.067 mg.[28]
	Niacin 0.86 mg.[28]
	Ascorbic Acid 27.0 mg.[28]
	Choline 106 mg.[2]
Same, steamed in very small amount of water in tightly covered saucepan (method of electric cookery)	Calcium 0.007 gm.[28]
	Phosphorus 0.047 gm.[28]
	Iron 0.54 mg.[28]
	Thiamin 0.16 mg.[28]
	Riboflavin 0.064 mg.[28]
	Niacin 0.90 mg.[28]
	Ascorbic Acid 26.0 mg.[28]
Potatoes, added to large amount of cold, distilled water, brought to a boil, then simmered until done	Calcium 0.007 gm.[28]
	Phosphorus 0.033 gm.[28]
	Iron 0.46 mg.[28]
	Thiamin 0.11 mg.[28]
	Riboflavin 0.034 mg.[28]
	Niacin 0.59 mg.[28]
	Ascorbic Acid 22.0 mg.[28]
Potatoes, peeled, raw	Niacin 0.364; 0.427; 0.555 mg.[12]
Same, boiled	Niacin 0.28; 0.364; 0.51 mg.[12]
Potatoes, whole, boiled	Ascorbic Acid 5.4 mg.[30]
Same, kept hot (80 to 85°C.) 20 minutes	Ascorbic Acid 4.0 mg.[30]
Same, kept hot 60 minutes	Ascorbic Acid 2.5 mg.[30]
Same, kept hot 135 minutes	Ascorbic Acid 0.9 mg.[30]
Same, kept at room temperature 135 minutes	Ascorbic Acid 4.3 mg.[30]
Potatoes, whole, boiled, then mashed	Ascorbic Acid 5.0 mg.[30]

Same, kept hot 20 minutes..	Ascorbic Acid 1.8 mg.[30]
Same, kept hot 30 minutes..	Ascorbic Acid 0.5 mg.[30]
Same, kept hot 135 minutes	Ascorbic Acid 0.4 mg.[30]
Potatoes, Montana, "Netted Gem," held in winter storage for several months, raw	Ascorbic Acid 9.1 mg.[42]
Same, whole, boiled in jackets	Ascorbic Acid 9.2 mg.[42]
Same, pared, quartered, then boiled	Ascorbic Acid 7.4 mg.[42]
Same, pared, quartered, soaked 4 hours in *fresh* water, then boiled	Ascorbic Acid 7.0 mg.[42]
Same, pared, quartered, soaked 4 hours in *salt* water, then boiled	Ascorbic Acid 7.7 mg.[42]
Same, pared, quartered, then cooked in pressure saucepan	Ascorbic Acid 8.1 mg. [42]
Same, pared, quartered, soaked 4 hours in *fresh* water, then cooked in pressure saucepan	Ascorbic Acid 7.8 mg.[42]
Same, pared, quartered, soaked 4 hours in *salt* water, then cooked in pressure saucepan	Ascorbic Acid 8.6 mg.[42]
Radishes, raw	Niacin 0.154; 0.136; 0.164 mg.[12]
Rape, raw	Choline 230 mg.[2]
Soybeans, green, raw	Choline 300 mg.[2]
Soybeans, mature (19.5% fat)	Choline 340 mg.[2]
Soybeans, dried	Niacin 4.0 mg.[53]
Spinach, raw	Niacin 0.782; 0.720; 0.7 mg.[12] Choline 238 mg.[2]
Same, boiled	Niacin 0.6; 0.627; 0.636 mg.[12]
Spinach, quick-frozen, raw	Thiamin 0.052 mg.[25]
Sweet potatoes, raw	Choline 350 mg.[12]
Sweet potatoes, yellow, peeled, raw	Niacin 0.527; 0.79; 0.627 mg.[12]
Same, boiled	Niacin 0.473; 0.736; 0.510 mg.[12]
Sweet potatoes, "Southern Queen," stored 4 months	Ascorbic Acid 1.14 mg.[31]
Same, boiled	Ascorbic Acid 0.17 mg.[31]
Same, baked	Ascorbic Acid 0.16 mg.[31]
Same, candied	Ascorbic Acid 0.21 mg.[31]
Sweet potatoes, "Triumph," stored 4 months, raw	Ascorbic Acid 2.14 mg.[31]
Same, boiled	Ascorbic Acid 0.71 mg.[31]
Same, baked	Ascorbic Acid 0.70 mg.[31]
Same, candied	Ascorbic Acid 0.22 mg.[31]
Sweet potatoes, "Triumph—Purple Stem," stored 5 months, raw	Ascorbic Acid 1.21 mg.[31]
Same, boiled	Ascorbic Acid 0.70 mg.[31]
Same, baked	Ascorbic Acid 1.36 mg.[31]
Same, candied	Ascorbic Acid 0.27 mg.[31]
Sweet potatoes, "Nancy Hall (1)", stored 5 months, raw	Ascorbic Acid 1.90 mg.[31]
Same, boiled	Ascorbic Acid 0.56 mg.[31]
Same, baked	Ascorbic Acid 1.87 mg.[31]
Same, candied	Ascorbic Acid 0.61 mg.[31]
Sweet potatoes, "Nancy Hall (2)," stored 6 months, raw	Ascorbic Acid 1.82 mg.[31]
Same, boiled	Ascorbic Acid 1.18 mg.[31]
Sweet potatoes, "Unit I Porto Rico," stored 6 months, raw	Ascorbic Acid 1.12 mg.[31]
Same, boiled	Ascorbic Acid 1.07 mg.[31]
Same, baked	Ascorbic Acid 1.77 mg.[31]
Same, candied	Ascorbic Acid 0.99 mg.[31]
Sweet potatoes, "Texas Porto Rico," stored 6 months, raw	Ascorbic Acid 1.72 mg.[31]
Same, boiled	Ascorbic Acid 1.15 mg.[31]
Same, baked	Ascorbic Acid 3.97 mg.[31]
Tomatoes, raw	Niacin 0.280; 0.364; 0.410 mg.[12]
Tomatoes, green, raw	Ascorbic Acid 10 to 33 mg.[32]
Same, ripe, raw	Ascorbic Acid 11 to 21 mg.[32]
Tomatoes, "Summerset," raw	Ascorbic Acid 21.6 mg.[33]
Tomatoes, "Vetomold," raw	Ascorbic Acid 18.7 mg.[33]
Tomatoes, "Early Baltimore," raw	Ascorbic Acid 17.9 mg.[33]
Tomatoes, "Rutgers," raw	Ascorbic Acid 17.7 mg.[33]
Tomatoes, "Gulf State Market," raw	Ascorbic Acid 17.7 mg.[33]
Tomatoes, "Pritchard," raw	Ascorbic Acid 17.6 mg.[33]
Tomatoes, "Essary," raw	Ascorbic Acid 17.3 mg.[33]
Tomatoes, "Ponderosa," raw	Ascorbic Acid 16.7 mg.[33]
Tomatoes, "Marglobe" (strain 6), raw	Ascorbic Acid 16.4 mg.[33]
Tomatoes, "San Marzono," raw	Ascorbic Acid 16.1 mg.[33]
Tomatoes, "Riverside," raw	Ascorbic Acid 16.1 mg.[33]
Tomatoes, "Pan American," raw	Ascorbic Acid 15.8 mg.[33]
Tomatoes, "Mingold," raw	Ascorbic Acid 15.7 mg.[33]
Tomatoes, "Montgomery," raw	Ascorbic Acid 15.5 mg.[33]
Tomatoes, "John Baer," raw	Ascorbic Acid 15.5 mg.[33]
Tomatoes, "Indiana Marglobe," raw	Ascorbic Acid 15.4 mg.[33]
Tomatoes, "Redcap," raw	Ascorbic Acid 15.3 mg.[33]
Tomatoes, "Bred-Rite Marglobe," raw	Ascorbic Acid 15.1 mg.[33]
Tomatoes, "Stokesdale," raw	Ascorbic Acid 15.1 mg.[33]
Tomatoes, "Norduke," raw	Ascorbic Acid 14.4 mg.[33]
Tomatoes, "Marhio," raw	Ascorbic Acid 14.4 mg.[33]
Tomatoes, "Early Shipper," raw	Ascorbic Acid 13.8 mg.[33]
Tomatoes, "N. Y. State," raw	Ascorbic Acid 13.7 mg.[33]
Tomatoes, "Earliana," raw	Ascorbic Acid 13.0 mg.[33]
Tomatoes, "Pearson," raw	Ascorbic Acid 12.6 mg.[33]
Tomatoes, "McGee," raw	Ascorbic Acid 11.9 mg.[33]
Tomatoes, "Victor," raw	Ascorbic Acid 11.2 mg.[33]
Tomatoes, "Bonny Best," raw	Ascorbic Acid 11.2 mg.[33]
Turnips, raw	Choline 94.0 mg.[2]
Turnip (*Brassica rapa*) greens, "Seven Top," raw	Ascorbic Acid 128 to 241[47]; 142[48], 148 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 110 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 52 mg.[49]
Turnip (*Brassica rapa*) greens, "Seven Top," stored 24 hours at 40°F., raw	Ascorbic Acid 142[48]; 150 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 110 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 46 mg.[49]
Turnip (*Brassica rapa*) greens, "Seven Top," stored 24 hours at room temperature, raw	Ascorbic Acid 119[48]; 122 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 82 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 30 mg.[49]
Turnip (*Brassica rapa*) greens, "Shogoin," raw	Ascorbic Acid 129[48]; 140 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 100 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 46 mg.[49]
Turnip (*Brassica rapa*) greens, "Shogoin," stored 24 hours at 40°F., raw	Ascorbic Acid 127[48]; 140 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 95 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 46 mg.[49]
Turnip (*Brassica rapa*) greens, "Shogoin," stored 24 hours at room temperature, raw	Ascorbic Acid 115[48]; 121 mg.[49]
Same, cooked 30 minutes	Ascorbic Acid 82 mg.[49]
Same, cooked 4 hours	Ascorbic Acid 31 mg.[49]
Turnip tops, raw	Choline 245 mg.[2]
Mixed vegetable juices (vegetable juice cocktails)	Ascorbic Acid 3.9 to 13.2 mg.[51*]
Tomato Juice (*See* Fruits, including Fruit Juices)	

IV. Milk and Milk Products

Milk, Cow's	
Whole, fresh	Riboflavin 0.17 mg.[11] Niacin 0.8 to 2.8 mg.[53] P-aminobenzoic Acid 0.015 mg.[39] Choline 14.7 mg.[2]
Same, after 62 months continuous lactation	Ascorbic Acid 2.405 mg.[37*]
Same, after 63 months continuous lactation	Ascorbic Acid 2.322 to 2.602 mg.[37*]
Same, after 64 months continuous lactation	Ascorbic Acid 2.348 to 3.354 mg.[37*]

Same, after 65 months continuous lactation	Ascorbic Acid 2.034 to 2.406 mg.[37*]
Same, dried	Choline 107.0 mg.[2]
	Ascorbic Acid 2.1 mg.[24]
Skim, fresh	Niacin 0.06 to 0.09 mg.[53]
	Choline 41 mg.[46]
	P-aminobenzoic Acid 0.0004 mg.[50]
Same, dried	Niacin 1.4 to 2.8 mg.[53]
	Choline 159.0 mg.[2]
Milk, Goat's	
"Toggenburg," whole, fresh	Ascorbic Acid 0.5 to 2.0 mg.[38*]
Milk, Human	Thiamin 0.015 mg.[54*]
Same, woman with 1st child	Calcium 0.0221 to 0.0316 gm.[40*]
	Phosphorus 0.012 to 0.0167 gm.[40*]
Same, woman with 2nd child	Calcium 0.0246 to 0.0308 gm.[40*]
	Phosphorus 0.0124 to 0.0156 gm.[40*]
Same, woman with 3rd child	Calcium 0.0234 to 0.0281 gm.[40*]
	Phosphorus 0.0119 to 0.0157 gm.[40*]
Cheese	
American	Riboflavin 0.66[11]; 0.41 mg.[41]
	Niacin 0.03 mg.[41]
	Pantothenic Acid 0.18 mg.[41]
	Biotin 0.0017 mg.[41]
Same, "green"	Riboflavin 0.59 mg.[41]
	Niacin 0.10 mg.[41]
	Pantothenic Acid 0.13 mg.[41]
Brick	Riboflavin 0.42 mg.[41]
	Niacin 0.11 mg.[41]
	Pantothenic Acid 0.28 mg.[41]
	Biotin 0.0028 mg.[41]
Camembert	Riboflavin 0.83 mg.[41]
	Niacin 1.60 mg.[41]
	Pantothenic Acid 0.85 mg.[41]
	Biotin 0.0056 mg.[41]
Chantelle	Riboflavin 0.47 mg.[41]
	Niacin 0.05 mg.[41]
	Pantothenic Acid 0.32 mg.[41]
	Biotin 0.0036 mg.[41]
Cheddar	Choline 48.0 mg.[2]
Colby	Riboflavin 0.51 mg.[41]
	Niacin 0.07 mg.[41]
	Pantothenic Acid 0.21 mg.[41]
	Biotin 0.0016 mg.[41]
Cream	Riboflavin 0.20 mg.[41]
	Niacin 0.06 mg.[41]
	Pantothenic Acid 0.14 mg.[41]
	Biotin 0.0012 mg.[41]
Parmisello, dried, grated	Riboflavin 0.71 mg.[41]
	Niacin 0.11 mg.[41]
	Pantothenic Acid 0.53 mg.[41]
	Biotin 0.0043 mg.[41]
Processed, "Limburger"	Riboflavin 0.35 mg.[41]
	Niacin 0.14 mg.[41]
	Pantothenic Acid 0.58 mg.[41]
	Biotin 0.0036 mg.[41]
Same, "Old English"	Riboflavin 0.57 mg.[41]
	Niacin 0.03 mg.[41]
	Pantothenic Acid 0.31 mg.[41]
	Biotin 0.0025 mg.[41]
Same, "Swiss"	Riboflavin 0.40 mg.[41]
	Niacin 0.07 mg.[41]
	Pantothenic Acid 0.26 mg.[41]
	Biotin 0.0011 mg.[41]
Same, "Velveeta"	Riboflavin 0.55 mg.[41]
	Niacin 0.14 mg.[41]
	Pantothenic Acid 0.55 mg.[41]
	Biotin 0.0046 mg.[41]
Roquefort, domestic	Riboflavin 0.45 mg.[41]
	Niacin 1.24 mg.[41]
	Pantothenic Acid 0.96 mg.[41]
	Biotin 0.0076 mg.[41]
Ice Cream	Riboflavin 0.2 mg.[11]
Buttermilk, dried	Niacin 1.3; 2.1 mg.[53]
Casein, dried	Choline 21 mg.[46]
Whey, dried	Riboflavin 2.5 mg.[11]
	Choline 70 mg.[46]

V. Meats, Poultry, Fish and Eggs

Meats	
Beef, hamburg, raw	Riboflavin 0.13 mg.[11]
Beef, muscle, raw	Niacin 4.4 mg.[53]
Beef, rib roast, raw	Choline 82.0 mg.[2]
Beef, roundsteak, raw	Choline 95.0 mg.[2]
Lamb, chops, raw	Choline 107.0 mg.[2]
Lamb, shoulder, raw	Choline 119.0 mg.[2]
Pork, chops, raw	Choline 77.0 mg.[2]
Pork, ham, fresh, raw	Thiamin 0.77; 1.41; 0.91; 1.35; 0.77; 1.48; 0.92; 1.30 mg.[55]
	Riboflavin 0.21; 0.33; 0.31; 0.36; 0.21; 0.33; 0.29; 0.34 mg.[55]
	Niacin 3.5; 3.1; 3.5; 3.8; 3.5; 3.1; 3.2; 3.6 mg.[55]
	Choline 88.0 mg.[2]
Same, roast	Thiamin 0.67; 1.41; 0.76; 1.35 mg.[55]
	Riboflavin 0.23; 0.35; 0.38; 0.43 mg.[55]
	Niacin 4.3; 3.5; 3.8; 4.7 mg.[55]
Same, braised	Thiamin 0.51 mg.[55]
	Riboflavin 0.22 mg.[55]
	Niacin 3.6 mg.[55]
Same, broiled	Thiamin 1.48; 1.04; 1.48 mg.[55]
	Riboflavin 0.39; 0.40; 0.44 mg.[55]
	Niacin 3.2; 4.1; 4.7 mg.[55]
Pork, loin, fresh, raw	Thiamin 0.74; 1.34; 0.96; 1.52; 0.74; 1.28; 0.99; 1.50; 1.40; 1.01; 1.32 mg.[55]
	Riboflavin 0.16; 0.26; 0.23; 0.28; 0.16; 0.27; 0.23; 0.30; 0.29; 0.24; 0.30 mg.[55]
	Niacin 3.1; 3.8; 4.8; 3.5; 3.1; 3.7; 4.7; 3.9; 3.8; 4.9; 3.6 mg.[55]
Same, roast	Thiamin 0.67; 1.20; 0.79; 1.42 mg.[55]
	Riboflavin 0.17; 0.30; 0.29; 0.34 mg.[55]
	Niacin 3.2; 4.1; 4.7; 3.7 mg.[55]
Same, braised	Thiamin 0.51; 0.99; 0.70; 1.0 mg.[55]
	Riboflavin 0.16; 0.29; 0.26; 0.33 mg.[55]
	Niacin 3.0; 3.2; 4.0; 3.9 mg.[55]
Same, broiled	Thiamin 1.56; 1.00; 1.42 mg.[55]
	Riboflavin 0.34; 0.32; 0.44 mg.[55]
	Niacin 4.9; 5.4; 5.2 mg.[55]
Pork, shoulder, raw	Choline 105.0 mg.[2]
Veal, rib roast, raw	Choline 113.0 mg.[2]
Brain, pork, raw	Choline 375.0 mg.[2]
Heart, pork, raw	Choline 231.0 mg.[2]
Small intestine, pork, raw	Choline 165.0 mg.[2]
Kidney, beef, raw	Choline 333.0 mg.[2]
Kidney, lamb, raw	Choline 360.0 mg.[2]
Kidney, pork, raw	Choline 256.0; 317.0 mg.[2]
Kidney, veal, raw	Choline 348.0 mg.[2]
	Niacin 21.2 mg.[53]
Liver, beef, raw	Choline 630.0 mg.[2]
Liver, pork, raw	Choline 552.0 mg.[2]
Liver, veal, raw	Choline 652.0 mg.[2]
	P-aminobenzoic Acid 0.02 mg.[3]
Pancreas, pork, raw	Choline 329.0 mg.[2]
Tongue, pork, raw	Choline 136.0; 139.0 mg.[2]
Sausage, bologna, raw	Choline 71.0 mg.[2]
Sausage, liver, raw	Choline 267.0 mg.[2]
Poultry	
Heart, chicken, raw	Choline 236.0 mg.[2]
Liver, chicken, raw	Choline 342.0 mg.[2]
Fish	
Red snapper, muscle, raw	Choline 84.0 mg.[2]
Trout, muscle, raw	Choline 87.0 mg.[2]
Eggs	
Whole, dried	P-aminobenzoic Acid 0.195; 0.247 mg.[50]
White, dried	P-aminobenzoic Acid 0.0055 mg.[50]
Yolk, raw	Choline 1713.0 mg.[2]
Same, dried	P-aminobenzoic Acid 0.08 mg.[50]

VI. Nuts

Peanuts, "Spanish" (43% fat)	Choline 167 mg.[2]
Peanuts, "Runner" (45.5% fat)	Choline 157 mg.[2]
Peanut butter	Calcium 0.032 to 0.048 gm.[43]
	Phosphorus 0.391 to 0.421 gm.[43]
	Iron 1.67 to 1.98 mg.[43]
	Thiamin 0.350 to 0.450 mg.[43]
	Choline 145 mg.[2]
Peanut meal, edible	Choline 2350 mg.[2]
Same (6% fat)	Choline 226 mg.[2]
Pecans	Choline 50 mg.[2]

VII. Miscellaneous

Chili products	
Green chili sauce, home-made, with tomato and onion	Ascorbic Acid 8; 38 mg.[29]

Same, commercially-canned	Carotene 4.26 mg.[29]
	Ascorbic Acid 19 mg.[29]
Red chili sauce, commercially-canned, from fresh peppers	Carotene 1.24 to 3.65 mg.[29]
	Ascorbic Acid 4 to 246 mg.[29]
Red chili sauce, home-made, from dried peppers	Carotene 6.29 mg.[29]
	Ascorbic Acid 2; 8 mg.[29]
Same, commercially-canned	Carotene 4.56; 26.1 mg.[29]
	Ascorbic Acid 6; 40 mg.[29]
Pickled chili, green pod	Ascorbic Acid 28 mg.[29]
Same, red pod	Ascorbic Acid 66 mg.[29]
Jams, jellies and preserves	
Jam, strawberry, "Dunlap," stored 1 to 14 days	Ascorbic Acid 34 mg.[34]
Same, stored 3 months	Ascorbic Acid 29 mg.[34]
Same, stored 6 months	Ascorbic Acid 24 mg.[34]
Same, stored 9 months	Ascorbic Acid 17 mg.[34]
Same, stored 15 months	Ascorbic Acid 15 mg.[34]
Jam, strawberry, "Gem," stored 1 to 14 days	Ascorbic Acid 20 mg.[34]
Same, stored 3 months	Ascorbic Acid 14 mg.[34]
Same, stored 6 months	Ascorbic Acid 10 mg.[34]
Same, stored 9 months	Ascorbic Acid 8 mg.[34]
Jam, strawberry, "Dunlap," with added pectin, stored 1 to 14 days	Ascorbic Acid 25 mg.[34]
Same, stored 3 months	Ascorbic Acid 21 mg.[34]
Same, stored 6 months	Ascorbic Acid 17 mg.[34]
Same, stored 9 months	Ascorbic Acid 13 mg.[34]
Same, stored 15 months	Ascorbic Acid 12 mg.[34]
Jam, strawberry, "Gem," with added pectin, stored 1 to 14 days	Ascorbic Acid 24 mg.[34]
Same, stored 3 months	Ascorbic Acid 20 mg.[34]
Same, stored 6 months	Ascorbic Acid 16 mg.[34]
Same, stored 9 months	Ascorbic Acid 9 mg.[34]
Jelly, buffalo-berry	Ascorbic Acid 80 to 90 mg.[15]
Jelly, strawberry, "Dunlap," with added pectin, stored 1 to 14 days	Ascorbic Acid 26 mg.[34]
Same, stored 3 months	Ascorbic Acid 25 mg.[34]
Same, stored 6 months	Ascorbic Acid 19 mg.[34]
Same, stored 9 months	Ascorbic Acid 12 mg.[34]
Jelly, strawberry, "Gem," with added pectin, stored 1 to 14 days	Ascorbic Acid 26 mg.[34]
Same, stored 3 months	Ascorbic Acid 21 mg.[34]
Same, stored 6 months	Ascorbic Acid 15 mg.[34]
Same, stored 9 months	Ascorbic Acid 9 mg.[34]
Preserves, strawberry, "Dunlap," stored 1 to 14 days	Ascorbic Acid 28 mg.[34]
Same, stored 3 months	Ascorbic Acid 23 mg.[34]
Same, stored 6 months	Ascorbic Acid 17 mg.[34]
Same, stored 9 months	Ascorbic Acid 13 mg.[34]
Same, stored 15 months	Ascorbic Acid 10 mg.[34]
Preserves, strawberry, "Gem," stored 1 to 14 days	Ascorbic Acid 20 mg.[34]
Same, stored 3 months	Ascorbic Acid 14 mg.[34]
Same, stored 6 months	Ascorbic Acid 10 mg.[34]
Same, stored 9 months	Ascorbic Acid 8 mg.[34]
Pickles	
Pickles, cucumber, fresh	Vitamin A 137.6; 123.2 I.U.[56]
	Vitamin C 156; 236 I.U.[56]
Same, Kosher	Vitamin A 96.8 I.U.[56]
	Vitamin C 184 I.U.[56]
Same, chips	Vitamin A 96.8 I.U.[56]
	Vitamin C 156 I.U.[56]
Same, bread and butter	Calcium 0.0300 gm.[56]
	Phosphorus 0.0301 gm.[56]
	Iron 2.06 mg.[56]
	Copper 0.36 mg.[56]
	Vitamin A 458 I.U.[56]
	Vitamin B_1 8.0 I.U.[56]
	Vitamin B_2 17 S.B.U.[56]
	Vitamin C 200 I.U.[56]
Same, dill	Calcium 0.030 to 0.198 gm.[56]
	Phosphorus 0.0175 to 0.0286 gm.[56]
	Iron 0.55 to 1.11 mg.[56]
	Copper 0.50 to 0.884 mg.[56]
	Vitamin A 111.2 to 126.4; 350 to 610 I.U.[56]
	Vitamin B_1 1.0 to 2.0 I.U.[56]
	Vitamin B_2 60.0; 12.0; 15.0 S.B.U.[56]
	Vitamin C 105 to 155 I.U.[56]
Same, processed dill	Calcium 0.0138 gm.[56]
	Phosphorus 0.0151 gm.[56]
	Iron 0.36 mg.[56]
	Copper 0.83 mg.[56]
	Vitamin A 66.4; 77.6; 56.8; 492 I.U.[56]
	Vitamin B_1 none[56]
	Vitamin B_2 12.0 S.B.U.[56]
	Vitamin C 146; 180; 186; 40.0 I.U.[56]
Same, pasteurized dill	Calcium 0.0225 gm.[56]
	Phosphorus 0.0223 gm.[56]
	Iron 1.80 mg.[56]
	Copper 0.25 mg.[56]
	Vitamin A 292 I.U.[56]
	Vitamin B_1 7.0 I.U.[56]
	Vitamin B_2 15.0 S.B.U.[56]
	Vitamin C 180.0 I.U.[56]
Same, salt-stock	Calcium 0.0336 gm.[56]
	Phosphorus 0.0288 gm.[56]
	Iron 1.16 mg.[56]
	Copper 0.84 mg.[56]
	Vitamin A 96.0 to 213.6; 600 I.U.[56]
	Vitamin B_1 1.0 I.U.[56]
	Vitamin B_2 10.0 S.B.U.[56]
	Vitamin C 54 to 202; 293 I.U.[56]
Same, sour gherkin	Vitamin A 27.2 I.U.[56]
	Vitamin C 132 I.U.[56]
Same, sour, mixed	Vitamin A 36 I.U.[56]
	Vitamin C 132 I.U.[56]
Same, spiced	Vitamin A 116 I.U.[56]
	Vitamin C 114 I.U.[56]
Same, sweet	Calcium 0.0114 gm.[56]
	Phosphorus 0.0233 gm.[56]
	Iron 0.3 mg.[56]
	Copper 0.65 mg.[56]
	Vitamin A 40.8; 84.8; 409 I.U.[56]
	Vitamin B_1 none[56]
	Vitamin B_2 10.0 S.B.U.[56]
	Vitamin C 164; 146.4; 44.8 I.U.[56]
Same, sweet gherkin	Vitamin A 63.2 I.U.[56]
	Vitamin C 182 I.U.[56]
Same, sweet mixed	Vitamin A 40.8; 102.4 I.U.[56]
	Vitamin C 198; 164 I.U.[56]
Same, sweet mustard	Vitamin A 69.6 I.U.[56]
	Vitamin C 62 I.U.[56]
Same, sweet relish	Vitamin A 79.2 I.U.[56]
	Vitamin C 146 I.U.[56]
Same, watermelon, home-made	Vitamin A 86.4 I.U.[56]
	Vitamin C 192 I.U.[56]
Syrups	
Black currant	Ascorbic Acid 0.070 mg.[57]
Molasses	P-aminobenzoic Acid 0.001 mg.[58]
Same, beet	Niacin 5.0; 4.7 mg.[53]
Same, blackstrap	Choline 86.0 mg.[2]
Same, cane	Niacin 4.4; 5.0 mg.[53]
Other Miscellaneous Items	
Beef extract ("Difco")	P-aminobenzoic Acid 0.0073 mg.[59]
Gelatin	P-aminobenzoic Acid 0.0013 mg.[59]
Liver extract	Choline 1593.0 mg.[2]
Same, (Lilly No. 343)	P-aminobenzoic Acid 0.50 mg.[3]
Liver residue, extracted	Choline 439.0 mg.[2]
Malt extract ("Difco")	P-aminobenzoic Acid 0.074 mg.[59]
Persimmon leaves, "Early Golden," fresh	Ascorbic Acid 325 mg.[20]
Same, dried	Ascorbic Acid 407 mg.[20]
Persimmon leaves, "Silkeline," fresh	Ascorbic Acid 203 mg.[20]
Persimmon leaves, "Lucinda," fresh	Ascorbic Acid 227 mg.[20]
Persimmon leaves, "Miller," fresh	Ascorbic Acid 269 mg.[20]
Same, dried	Ascorbic Acid 285 mg.[20]
Persimmon leaves, "Ruby," fresh	Ascorbic Acid 306 mg.[20]
Same, dried	Ascorbic Acid 409 mg.[20]
Persimmon leaves, wild, fresh	Ascorbic Acid 328; 250; 271 mg.[20]
Same, dried	Ascorbic Acid 380; 415; 255 mg.[20]
Potato chips	Ascorbic Acid 16 mg.[24]
Rice bran concentrate	P-aminobenzoic Acid 0.11 mg.[58]
Same, ("Galen B")	P-aminobenzoic Acid 0.200 mg.[59]
Rose hips, dried extract	Vitamin A 6000 I.U.[57]
	Ascorbic Acid 1300 to 1500 mg.[57]
Soybean meal	Riboflavin 0.33 mg.[11]
	Choline 21 mg.[46]
Same (2.5% fat)	Choline 345 mg.[2]
Yeast, baker's	Niacin 28.9 to 54.3 mg.[53]

Yeast, dried..... Riboflavin 6.2 mg.[11]
Yeast, brewers', dried..... P-aminobenzoic Acid 10.2[3]; 6.6; 1.1; 6.1 mg.[50]

Reprints of this and the two previous compilations are available from the American Dietetic Association, 620 N. Michigan Avenue, Chicago 11, at 20 cents each.

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A SYNDROME OF DIETARY ORIGIN IN THE PREGNANT RAT RESEMBLING TOXEMIA OF PREGNANCY[1]

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A CHARACTERISTIC disturbance at parturition has been observed in our laboratory during the course of a study dealing with the effect upon reproduction and lactation in the albino rat of feeding certain diets containing meat (1). The disorder prevailed among rats maintained on a ration containing dried autoclaved pork muscle equivalent to 15 per cent protein. About one-third of the animals developed the disease.

The physiology of the rat resembles that of the human being in many respects, including placental structure and function. Since the symptoms of the disorder were analogous to those of toxemia of pregnancy in women, it seemed that a unique opportunity had presented itself for a study of the disease in an experimental situation. Several investigations, therefore, were planned to secure information on biochemic and histologic aspects of the disturbance in rats. The present report deals with the general symptomatology of the disease and the gross and histologic changes occurring in certain organs.

For convenience, the terms "toxic" and "non-toxic" have been used in this report to differentiate experimental groups, even though they may be misnomers. Their true applicability must await further delineation of the disease.

EXPERIMENTAL PLAN

Young female rats of inbred Wistar stock were divided into 2 groups, *i.e.* experimental and control, at the time of the opening of the vaginal orifice. One-half of the animals in each group were kept as virgins, the other half were mated. So far as possible, litter-mates were distributed evenly among the 4 groups. The experimental animals were fed the meat diet designated as Pork I; the control females, a mixed grain diet, Steenbock V, which has proved adequate for the maintenance of reproduction in our stock colony (2). This experimental grouping permitted an assessment of the effect of pregnancy and of diet on the organs studied. Since not all the animals fed the pork diet developed the disease, this group was further divided into the toxic and non-toxic females, and conditions characterizing each group were compared. It was hoped that some basic lesion might thereby be discovered that would lead to a better understanding of toxemias of pregnancy.

Histologic sections were made of the liver, spleen, kidney, heart, pancreas, placenta, and feti. In each group, sections were made in so far as possible of tissues removed from 10 rats. In addition, the average weight, moisture, and fat content of the liver; weight and moisture content of the kidney; and average weight of fetus and placenta were determined. The number of rats used for each of these analyses is indicated in Table 1.

The Pork I diet had the following composition: canned pork muscle (dried to one-half its original weight), 25 gm.; cornstarch, 53 gm.; yeast, 5 gm.; agar-agar, 2 gm.; NaCl, 1 gm.; Osborne and Mendel salt mixture, 4 gm.; butter fat, 8 gm.; and cod liver oil, 2 gm. Assay proved that the diet was not deficient in vitamins A, E, or K. Analysis showed that it contained 13.6 per cent fat and 0.031 per cent free cholesterol (3).

TABLE 1

Size, water content, and fat content of livers; size and water content of kidneys

ORGAN	DIETARY GROUP	REPRODUCTIVE STATUS OF GROUP	AVERAGE SIZE		AVERAGE MOISTURE		AVERAGE FAT (DRY BASIS)	
			No. of analyses	Weight in grams	No. of analyses	%	No. of analyses	%
Liver	Control series fed Steenbock V diet	Virgin	9	5.260	9	68.9	9	20.6
		Mated	10	7.015	10	70.3	9	22.0
	Experimental series fed Pork I diet	Virgin	9	5.490	9	69.0	9	25.0
		Mated						
		Non-toxic	15	6.917	15	65.3	15	40.1
		Toxic	8	8.169	8	67.7	8	46.7
Kidney*	Control series fed Steenbock V diet	Virgin	7	1.473	16	77.4	—	—
		Mated	3	1.473	13	77.1	—	—
	Experimental series fed Pork I diet	Virgin	3	1.478	14	77.0	—	—
		Mated						
		Non-toxic	6	1.648	16	76.7	—	—
		Toxic	4	1.847	4	83.8	—	—

* Data secured in the present experiment augmented by those collected by Weedman (8) in comparable test series.

The meat, obtained from the Iowa Packing Company, was canned in lots varying in size from 500 to 1500 lb. Before canning, the meat was closely trimmed of fat, and ground. Portions weighing 1 lb. each were placed in cans which were sealed and processed for 65 min. at 15 lb. pressure. When the cans were opened, the fat congealed on the surface was removed and discarded, and 1000 gm. meat was then spread in a thin layer on a monel metal tray covered with cheesecloth, and dried to one-half its original weight under a current of warm air in an oven kept below 100° C. Approximately one hour was required. This concentration was necessary for the adjustment of the protein value of the diet.

The diet was mixed twice weekly and stored in a refrigerator. A quantity of food slightly greater than the rat could eat was fed daily and the portion unconsumed at the end of the day discarded.

The laboratory stock ration (Steenbock V) fed the con-

[1] Journal paper No. J-911 of the Iowa Agricultural Experiment Station, Ames, project No. 536. Preliminary reports presented before the American Institute of Nutrition, Baltimore, March 1938, and the American Dietetic Association, Detroit, October 1942. The data reported in this paper are taken in large part from a thesis submitted by Williamina E. Armstrong to the Graduate School of the Iowa State College in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Nutrition, June 1939. Received for publication July 23, 1943.

trol groups was a modification of one of Steenbock's early diets (4). It contained yellow corn meal, 64 gm.; crude casein, 5 gm.; linseed meal, 16 gm.; ground alfalfa, 2 gm.; NaCl, 0.5 gm.; $CaCO_3$, 0.5 gm.; yeast, one-fourth of which was irradiated, 2 gm.; wheat germ, 10 gm. This basic ration was supplemented with liquefied "Klim" fortified with cod liver oil and the trace elements. In addition, lettuce and raw ground beef were fed on alternate days.

The course of the reproductive cycle was followed daily by a microscopic examination of cells removed from the vagina. Normal stock colony males of the same age as the females, in general, were used for mating. In some instances, sibling males fed the pork diet were used. The females were weighed daily. Beginning with the twelfth day of pregnancy, the amount of water consumed daily by the control and experimental rats was measured carefully. Further details relating to dietary management, care, handling, and mating of animals are described elsewhere (1).

The symptomatology of the disease was observed in one group of animals as it progressed to its terminal stage and death occurred. Organs and tissues were examined at the end of the second pregnancy except in those cases where an experimental female exhibited signs of the pregnancy disorder during the first gestation. Such animals as well as those developing the disease in the second gestation, were killed as soon as the initial symptoms appeared. The rats whose pregnancies progressed normally were killed 21.5 days ±3 hours after positive mating occurred. Each virgin animal was killed at the same age as the gravid female with which it was paired. Prior to this, the rectal temperature was taken with a one-minute clinical thermometer and the physical condition of the animal studied by means of a subjective rating scale so arranged that a normal rat in seemingly perfect health received a score of 62 (5).

The rats were stunned by a blow on the head and the organs needed for study were quickly removed and prepared immediately for the specific analysis for which they were intended. The Zenker-paraffin-Delafield-hematoxylin method was used in preparing the tissues for histologic study. The feti and placentae were removed from two-thirds of the gravid animals in each group and weighed. In the remaining rats, the uterus was ligated at the cervix and at the Fallopian tubes immediately upon exposure, injected with a concentrated Zenker's solution and immersed in the same solution.

RESULTS

General Symptomatology. During the progress of the present experiment, approximately 30 per cent of the pregnant animals in the laboratory fed the Pork I diet developed the pregnancy disorder. Twenty-three sick animals were observed. Toxic females always appeared in perfect health until the twenty-first or twenty-second day of gestation. Then a fulminating disease suddenly developed, which, if allowed to progress, invariably led to death. The body temperature dropped from an average of 97 to 92°F. The hair stood erect and the feet were cold and pale. In most instances, violent shivering, gnashing of the teeth, and convulsions marked the progress of the disease. Very often, the sick rat died gripping the wall of the cage with its teeth. Then, a blood-tinged froth at the nose was often noted. Other animals slipped into a coma and became oblivious to their surroundings. Hematuria and vaginal hemorrhage were frequently observed. Breathing was labored and the skin and mucous membranes became increasingly cyanotic as the illness developed. Often a sick rat supported her head on a food cup, apparently trying to find a comfortable position. When labor was initiated, it was protracted and the young were born dead. Death of the female usually occurred during a convulsion. Over a period of 8 years, these characteristic symptoms of the disturbance have never been observed in pregnant control females fed the Steenbock V diet, nor in the rats of the stock colony.

Before the onset of the disease, it was impossible with the use of the above-mentioned rating scale to distinguish, on the basis of physical appearance alone, between the gravid animals in the pork-fed group that would or would not become sick. Neither could rats of the latter group and those of the control series (scores 49 and 48, respectively) be differentiated by this scale. A rat apparently perfectly healthy at one observation might be dead one-half hour later. When the comatose type of disease developed, the rat might live for as long as 48 hours.

In view of the evidence (6) that pregnant women with toxemia gain weight abnormally, the relative gains in weight made by toxic and normal animals during pregnancy were studied. The significance of gains in body weight made by a gravid, multiparous animal like the rat is difficult to evaluate because of variability in the weight of the uterine contents. To meet this problem, the records of the females in the stock colony were scrutinized and from the group, normal animals were selected that produced litters which were the same as the unborn litters of the sick rats in regard to average size and total weight. Two matched groups, each consisting of 10 females, were thus obtained. The average increment in weight made by each group during pregnancy was determined. It was found that each series had gained in weight at an almost identical rate (Fig. 1) until the eighteenth day. Then an abnormally sharp increase occurred in the average weight of the sick females, amounting in certain individual cases to 32 per cent of the entire gain made during pregnancy.

TABLE 2

Average water consumption of rats during gestation

DIETARY GROUP	NO. RATS IN GROUP	CONSUMPTION OF WATER DURING 2-DAY INTERVALS IN GESTATION				
		12–13th	14–15th	16–17th	18–19th	20–21st
		ml.	*ml.*	*ml.*	*ml.*	*ml.*
Steenbock V	15	14.4	14.5	15.5	16.7	17.1
Pork I						
Non-toxic	14	13.3	17.2	17.5	18.1	17.6
Toxic	10	18.6	18.2	19.1	24.5	15.4

The gravid control animals were drinking about 14 ml. water per day at the time when pregnancy had progressed one-third its course. From then on, the average water intake increased slowly to term (Table 2). In contrast, the experimental rats that developed the pregnancy disorder drank appreciably greater amounts of water during gestation. Their daily average intake reached a peak of 24.5 ml. on the eighteenth and nineteenth days (control rats, 16.7 ml. per day), after which it fell abruptly to 15.4 ml. during the last 2 days of the period.

Gross observation at necropsy indicated many abnormalities of the viscera in the sick animals. The liver was swollen, extremely yellow and friable; the kidneys, enlarged and congested with blood; the heart, contracted; and the coronary vessels packed with blood. Often the pleural cavity contained either free blood or 3 to 5 ml. of a serous fluid. In a few cases, a marked edema of the pancreas was observed; in others, the abdominal cavity was filled with fluid. So extensive were these exudations that one might say that the animal had "drowned in its own body fluids." In all other animals, the viscera appeared normal except for the liver in the "healthy" pork-fed group. In these animals, too, the liver was swollen, yellow, and friable.

The blood vessels of the uterus and those of the placenta were distended with blood. Sometimes large clots of blood were present in the uterus. In some instances, a hemorrhage seemed to have arisen at the base of the placenta. In other instances, the amniotic fluid was tinged with blood. The placentae were pale in color and seemed small. Although the feti were invariably dead, in general they were so well developed and firm that it seemed they had not been dead very long (7).

In the group of normal rats fed the control Steenbock V ration, the average number of feti produced per rat was 11.3; the average weights of the fetus and placenta, respectively, 5.08 and 0.481 gm.; and the ratio of fetal to placental weight, 0.0946. The sick females had an average of 11.8 feti, each weighing 5 gm.; the non-toxic animals receiving the same diet had 10.6 feti with an average weight of 4.1 gm. The average weights of individual placentae in the sick and seemingly healthy groups of rats were 0.342 and 0.383 gm., respectively. When the large size of the feti of the toxic rats is considered, the small difference between the average placental weights becomes more significant. The ratio of placental to fetal weight was 0.0684 for the sick females, and 0.0934 for the apparently healthy experimental rats.

Condition of Liver and Kidney. The average size, hydration, and fat content of livers, as analyzed by a co-worker (3), are shown in Table 1. The ingestion of the meat diet increased the liver fat in the virgin rat by 5 per cent. While pregnancy *per se* induced only a small increment in the fat content of liver of the control animal, the increase was marked in the pork-fed female, values rising to 40.1 per cent (dry basis) in the non-toxic gravid rat, and to 46.7 per cent in the sick animal. The deposition of fat was accompanied by a loss in the moisture content of the tissue. The dehydration was more marked in the healthy pork-fed rat than in the comparable toxic female. If the animal did not develop toxemia, there was no increment in the size of the liver beyond the normal enlargement brought on by the gravid state. However, a significant increase in size always accompanied the toxemia.

Pregnancy in the normal control rat produced no enlargement of the kidney nor any change in its water content (Table 1). The kidney was larger than normal in the pork-fed rat, a condition particularly noticeable in the toxic animal. Only in the sick rat did the organ seem edematous (per cent moisture, 83.8 *vs.* 77.1). Swelling was also demonstrated by the fact that after bisection of the kidney, the two halves when fitted together no longer matched.

Histopathology of Organs. Photomicrographs of sections of hepatic tissue representing the different groups of rats are shown in Plate 1. Two conditions seemed to produce a moderate swelling of the hepatic cells, *i.e.* the feeding of the pork-containing diet to the virgin animal and pregnancy itself in the control rat. Greater damage, however, occurred in the tissue of the gravid non-toxic rat than in the pregnant control rat. The outlines of the cells were indistinct, the nuclei stained poorly and a slight fatty infiltration was noticeable. These abnormalities became severe in the toxic animals. Marked fatty degeneration accompanied by varying degrees of fatty infiltration and areas of focal necrosis were so prevalent that the characteristic hepatic structure was nearly lost.

The renal epithelium in kidneys removed from animals in all control and experimental groups showed stratification of the cytoplasm with condensation at the periphery of the cells and hyaline degeneration (Plate 2). These changes were more apparent in the pregnant control and the virgin experimental animals than in the virgin control rats. The lesions, however, even in the non-toxic pregnant animals receiving the pork-containing diet, were mild and never approached the severity of those occurring in the toxic animals. For example, extensive hemorrhage within the tubules of the kidneys invariably accompanied the development of the pregnancy disease. The renal epithelium was almost completely destroyed. Large, deeply-stained nuclei could be found, but the cytoplasm was so fragmented that the cell outlines were completely lost. The blood vessels were distended. Hemorrhages occurred throughout the organ with the exception of the glomeruli which showed only marked hyperemia. There were no signs of either recent or long-standing infection. The animals that were sick for several hours before they died showed more extensive renal damage than did the rats that died suddenly without any previous symptoms of the disorder.

No changes other than hyperemia could be detected in heart or spleen removed from the animals in any group. In those sick animals in which the pancreas appeared edematous, the pancreatic acini were contracted and stained deeply, and the connective tissue supporting the acini was destroyed. Pancreas tissue removed from the other animals showed no deviation from normal.

Pathological changes in feti and placentae were noted only in rats that were acutely ill. They formed a constant and characteristic picture (Plate 3). Comparison of photomicrographs No. 1, 2, and 3, shows that in these rats, many of the maternal sinuses were completely devoid of blood. In every case, the fetal blood in the placenta, the umbilical vein, the liver, and the heart showed varying degrees of hemolysis (No. 6). The umbilical veins (No. 4) also contained thrombi so large that they nearly blocked the vessel.

DISCUSSION

It has been shown that the ingestion of the experimental diet (Pork I) is responsible for certain cellular changes in the tissues of the liver and kidney of the virgin test animal. While these changes become more pronounced with the imposition of pregnancy, they become severe only with the development of the pregnancy disease. Certain lesions appear to be characteristic of the sick rats, *i.e.* marked fatty degeneration of the liver, destruction of tubular epithelium in the kidney, anemic placentae, large well-developed dead feti with thromboses in the umbilical veins, and hemolysis of fetal blood. These changes occur irrespective of whether a female is sick for several hours or dies suddenly. The renal lesions do not seem to be of long standing and may reflect metabolic disturbances or changes in blood circulation.

Why one female should develop the pregnancy disorder while her litter-mate sister with the same environmental and dietary history has an uneventful parturition is still a mystery. Certain characteristic changes in the liver and kidney are revealed in the present study that are common to both the toxic and non-toxic state, *i.e.* the enlargement of the kidney, the disturbance in the moisture content of the liver, and the large quantity of fat present in the liver. If the heavy load of fat impairs hepatic function, why do not all animals fed the Pork I diet develop the disease? The mild lesions observed in the hepatic and renal tissues of the non-toxic rats may represent the fundamental disorder brought on by the diet. If so, what factor operates in the sick rats to precipitate the fatty infiltration of the liver and the degeneration of the tubular epithelium in the kidneys?

It is impossible as yet to do more than trace the possibilities suggested by other symptoms. The uniform appearance of numerous well-developed but dead feti may point to an excessive development of fetal tissue as an important factor. The placental anemia may result in a placental tissue too inactive to mantain the feti. Or,

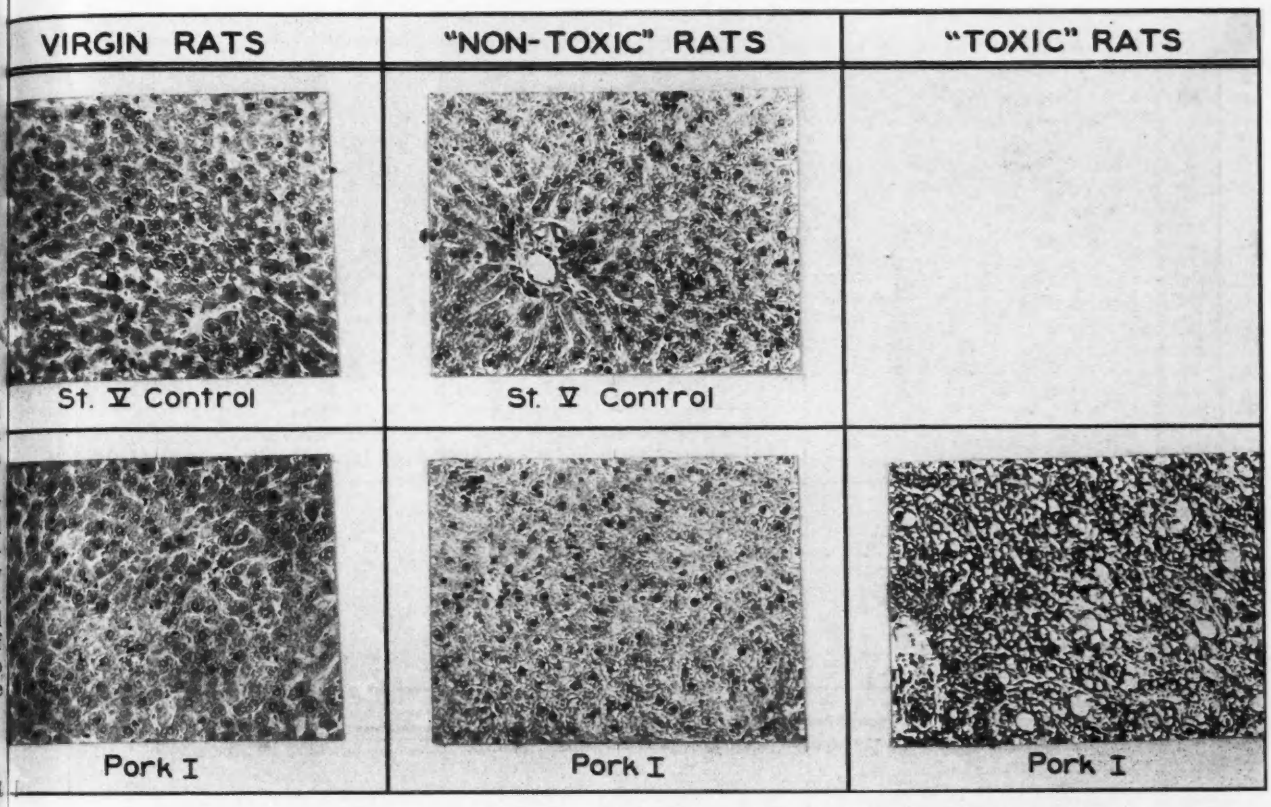


PLATE 1. *Photomicrographs of hepatic tissue from control and experimental animals (magnification 160 ×)*

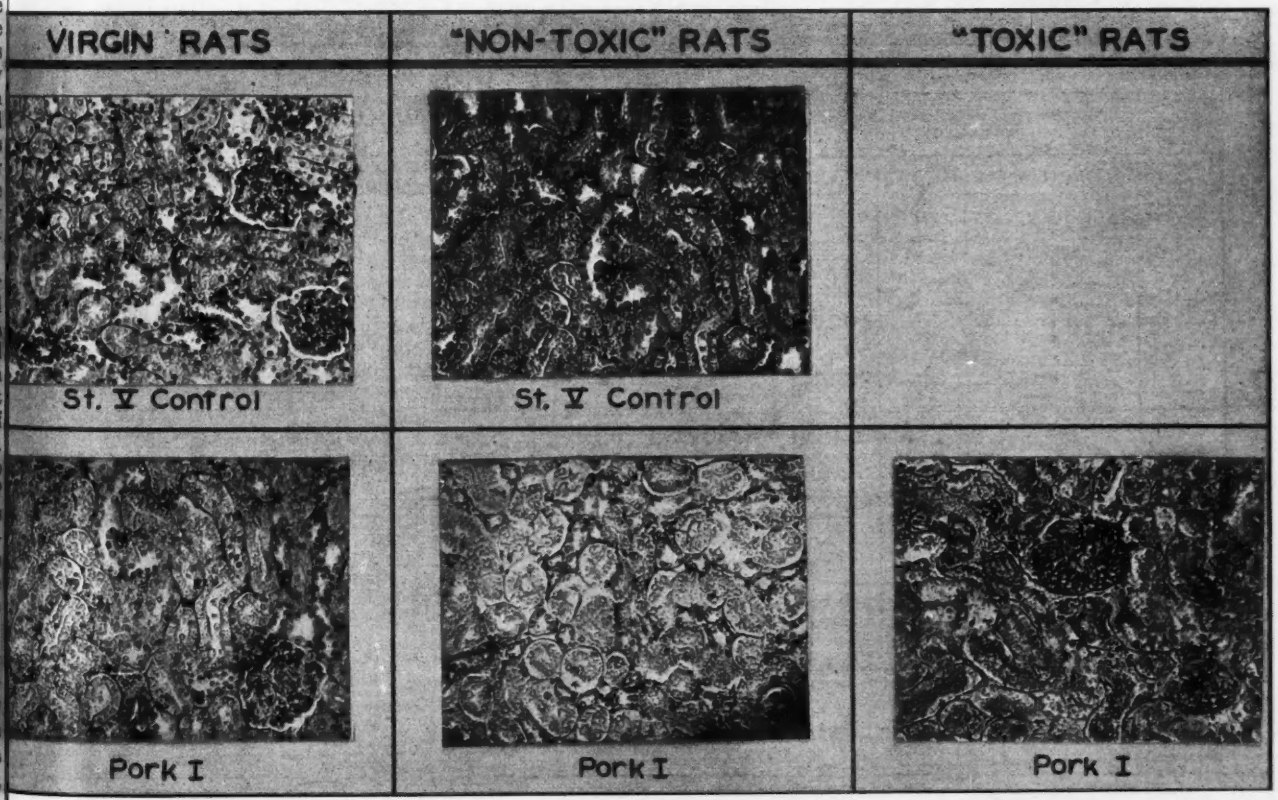
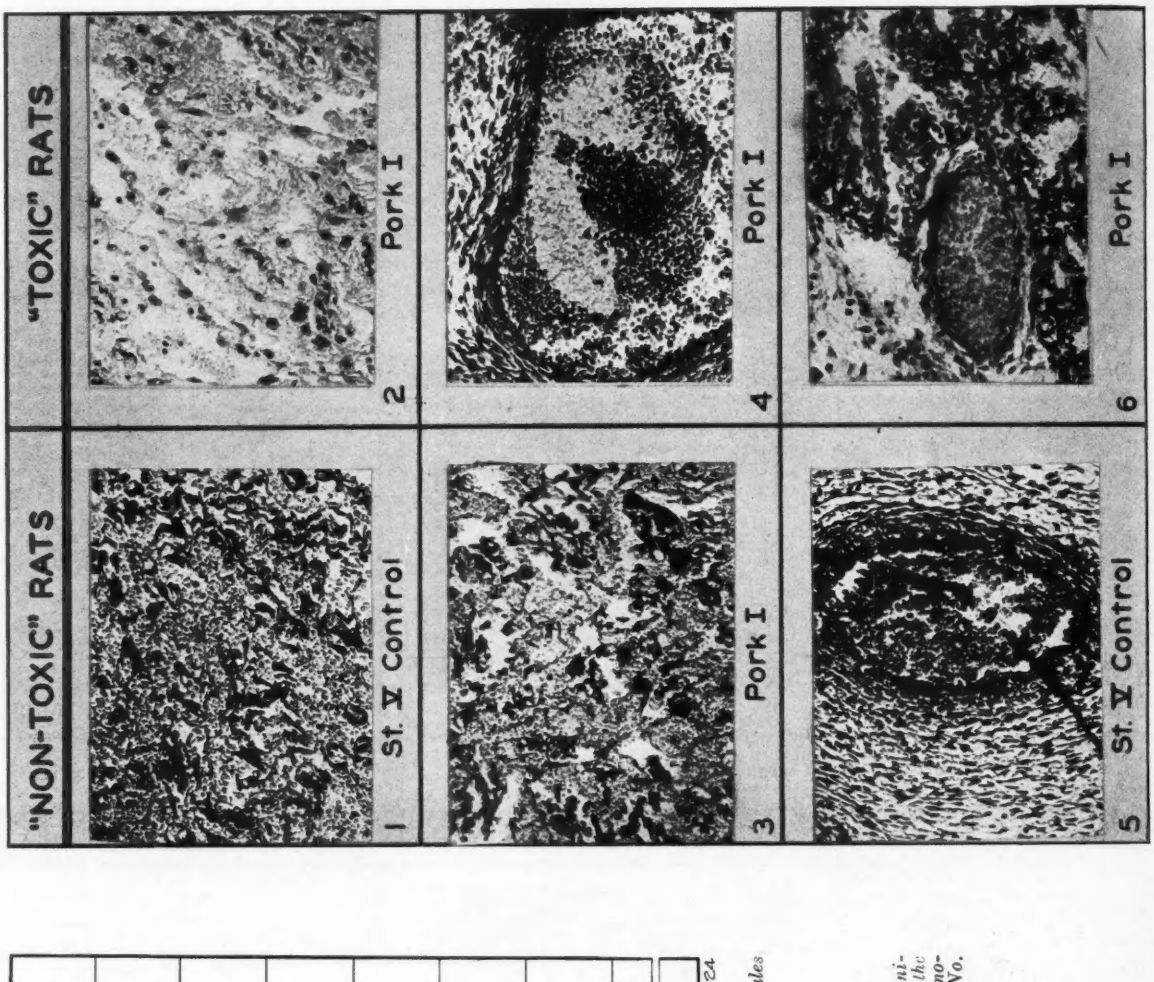


PLATE 2. *Photomicrographs of renal tissue from control and experimental animals (magnification 160 ×)*



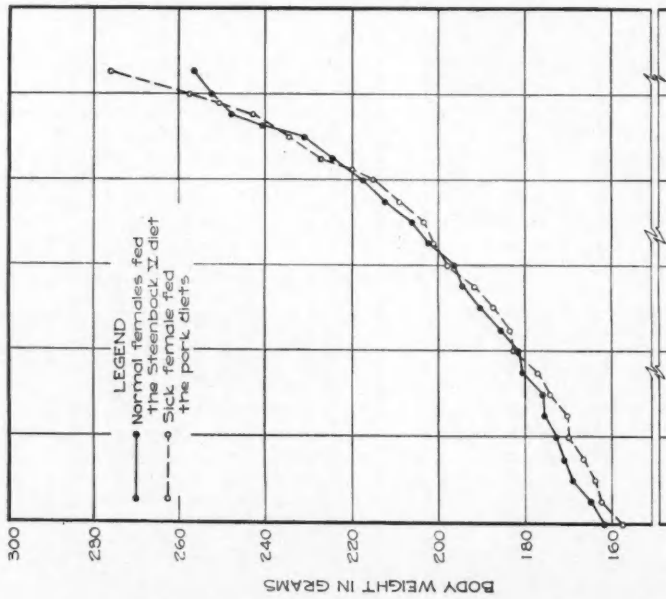


FIG. 1. *Gains made in weight during pregnancy by normal females and sick females matched as to number and total weight of young produced*

PLATE 3. *(Right)*

Photomicrographs of placentae from experimental and control animals (No. 1, 2 and 3); blood in the umbilical veins of fetl from the experimental and control females (No. 4 and 5); and partially hemolyzed blood in the pulmonary vein of a fetus from a sick rat (No. 6) (magnification 160 ×)

again, the thrombi in the umbilical veins may indicate the presence of a circulating toxin.

The abnormally large gains in weight made by the sick females point to water retention. If the drop in water intake is used as a criterion, the retention probably started as early as the twentieth day of gestation. Also, the increased size of the kidney together with the change in its water content may indicate edema as a precipitating factor.

The literature contains many references to reproductive disorders in rats fed diets deficient in one or more of the essential food nutrients. With the possible exception of the syndromes related to a dietary lack of vitamin A (9), vitamin E (10), or unsaturated fatty acids (11), gestational abnormalities earlier described bear little similarity to the characteristic train of events noted in the present experimental situation. However, a condition closely resembling a toxic pregnancy has been observed in various animals subjected supposedly to adequate dietary influences. Hartwell (12) has reported a parturient abnormality in the rat under such a regimen. Ross, Phillips, and Bohstedt (13) have observed intrauterine hemorrhage resulting in death to the fetus and toxemia to the mother in rats fed "practical" rations used for the feeding of swine. Certain investigations of Greene (14) deal with a gestational disorder in his stock colony of rabbits. The eclamptic state has also been described in gravid sheep (15) and cattle (16) under routine conditions of farm management.

In rabbits, cattle, sheep, and women, the eclamptic condition has been noted under circumstances that outwardly at least, seem normal, no contributing factor in the environment, habits, or characteristics of the individual apparently being responsible. However, the basic cause for the experimental toxemia induced in the present experiment appears to be of dietary origin since some of the females receiving the meat diet invariably developed the condition while none of a group of litter-mate females fed the control ration did. That diet may play a part in the development of human toxemias is too important an implication to ignore and one which has had substantiation in the significant studies of Ebbs, Tisdall, and their associates (17) and those of the committee of the People's League of Health in Great Britain (18).

Since the pork diet used in the present experiment did not support reproduction, it must be classed as inadequate. In theory, several factors could have contributed to its nutritive inefficiency. For example, the canning and drying processes may have lowered the nutritive value of the meat proteins; the fat-soluble vitamins A and E may have been destroyed by rancidity products produced in the meat fat following autoclaving; or the diet may have contained an insufficient supply of the better known members of the B complex or of choline. Experiments to be described in subsequent publications indicate that if there is a dietary deficiency in the pork diet, it cannot be ascribed to any of the just-mentioned factors. However, one or more of the recently identified members of the B complex may be specifically needed for the control of normal reproductive function (19). We have already published evidence (1) that beef muscle contains a protective factor. Finally, the effect of a possibly distorted balance of concentration of the various vitamins in the diet must not be disregarded.

SUMMARY

The feeding of a specific diet containing dried canned autoclaved pork muscle to female albino rats produced a typical disturbance of pregnancy in 30 per cent of the animals of the group. The disease was characterized by cyanosis, convulsions, and death shortly before parturition. Irrespective of whether or not the pregnancy disease developed, the livers of the experimental animals contained a large quantity of fat. Histological examination of tissues removed from the sick animals showed extensive fatty degeneration in the liver, hemorrhage in the kidney, destruction of renal epithelium, and an anemia of the placenta, accompanied by hemolysis of fetal blood. That the sick rats may suffer from a disturbed water balance was indicated by an abnormal water consumption, an excessive gain in body weight during the last days of pregnancy, and disturbances in the moisture content of the liver and kidney.

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EVALUATION OF A PROTEIN HYDROLYSATE AS A SOURCE OF THE ESSENTIAL AMINO ACIDS FOR THE HUMAN[1]

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THE logical approach to the economical preparation of a protein hydrolysate furnishing a high proportion of essential amino acids, is through enzymic digestion of the protein material. Acid hydrolysis involves refluxing operations, repeated vacuum distillations if hydrochloric acid is chosen for the hydrolysis, or laborious time-consuming centrifugations (of barium sulfate) if sulfuric acid is selected and use of special equipment which is not attacked by strong acid at the high temperature required for protein cleavage. Furthermore, acid hydrolysis tends to destroy tryptophane, one of the essential amino acids. Alkaline hydrolysis, on the other hand, results in decomposition of cystine and conversion of arginine into ornithine and ammonia. Furthermore, while acid hydrolysis causes only partial racemization of the amino acids, alkaline hydrolysates contain the amino acids in a completely racemized state. The optically active isomers of 5 and possibly 6 of the essential amino acids are not biologically active (1). The only advantage of both acid and alkaline hydrolysis is that they effect complete conversion of protein to amino acids.

The proper selection of the initial protein material is of major significance in determining the cost and quality of the final hydrolysate. The factors which must be considered are: (a) the essential amino acid composition of the protein present; (b) the quantity of extraneous matter such as carbohydrate and fat intimately associated with the protein material; (c) the ease with which the protein fraction can be isolated for hydrolysis; and (d) the cost and availability in large quantities of the basic material.

Block and Bolling (2) have listed the essential amino acid composition of various food materials. Analyses for extraneous materials, such as fat, carbohydrate, and ash, may be conducted to determine whether these are present in sufficient concentration to necessitate their removal. Frequently it may be more efficient to isolate the protein fraction as such, leaving the inert material behind. Thus, in the case of casein, precipitation of the protein at its isoelectric point and subsequent washings with acidulated water at the same *p*H have frequently been used to obtain a highly purified protein. Heat coagulation and subsequent washings of the coagulum may be employed to separate heat-coagulable proteins, such as lactalbumin, serum proteins, etc. from solution. Many inexpensive protein sources of high nutritive value, some of them by-products, such as meat scraps, whole blood, skim milk, yeasts, soybeans, etc. are available in bulk quantities.

For purposes of illustration the present discussion is limited to the preparation and evaluation of a specific hydrolysate. Whole beef blood was subjected to pancreatic digestion according to a procedure to be published in detail elsewhere (3). The various constants and properties of this protein hydrolysate are given below, not with the purpose of suggesting these as goals or standards for other amino acid concentrates but of demonstrating an objective procedure for ascertaining the limitations of any given hydrolysate so that improvement may follow. The method of evaluation also suggests what quantities of an amino acid hydrolysate should be administered to constitute an effective therapeutic dose.

The whole blood hydrolysate as prepared by this method was a light (almost white) fluffy powder and contained 11.8 per cent nitrogen on the dry basis. According to the maximal and constant formol titration values (4),[2] the degree of hydrolysis of the whole blood proteins approximated 85 per cent. The material in solution prior to dehydration was found to be free from intact protein, according to the sulfosalicylic acid precipitation procedure of Rona and Kleinmann (6). Freedom from proteoses was indicated by the absence of turbidity after the addition of a saturated zinc sulfate solution (7). A slightly positive test for peptones, flocculation on the addition of solid ammonium sulfate (8), was obtained. In view of the high formol titration values at the conclusion of the enzymic digestion, it was concluded that the hydrolysate consisted principally of free amino acids and to a small extent of simple peptides and peptones.

Preliminary heat coagulation of the blood proteins, employed primarily to convert the proteins into a form more readily attacked by the pancreatic enzymes, also destroyed most of the micro-organisms present. When toluene or chloroform was added as the preservative during the subsequent incubation periods, the bacteriological counts decreased to zero, *i.e.* the hydrolysates became sterile. This is an important consideration since micro-organisms can readily decarboxylate amino acids to yield toxic amines, and produce phenolic compounds, mercaptans, etc. After clarification with an activated charcoal, a solution free from pyrogens was obtained.

Since the hydrolysis was conducted under conditions optimal for the enzymic digestion, only minimal quantities of the enzyme powder were added. The resulting product contained amino acids largely derived from the whole blood proteins; only 5 to 10 per cent of the amino acids were from the protein contributed by the enzyme preparation. There is no objection to the presence of amino acids from other protein sources, provided the essential amino acid composition is not adversely affected. However, designation of a preparation as a casein hydrolysate or of another as a whole blood hydrolysate, when as much as 50 per cent of the amino acids are derived from the enzyme preparations (9–11), seems to be hardly justifiable.

ANALYSES FOR THE ESSENTIAL AMINO ACIDS

Analyses were conducted (2) to determine the essential amino acid composition of the whole blood hydrolysate. The results, presented in Table 1, indicate one-half of the amino acids in the final hydrolysate to be essential amino acids. It is surprising that makers of commercial protein hydrolysates (9–13) purporting to be effective oral and parenteral replacements for dietary protein, fail to list their essential amino acid compositions. The inference is that the hydrolysates contain the amino acids characteristic of the intact proteins. However, this is not true since processing losses do occur, particularly of the less soluble factors such as tyrosine, cystine, and isoleucine, during the concentration and clarification procedures. These are in addition to the destruction of tryptophane, if acid hydrolysis is used (12, 13) and of arginine and

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[2] Rather than use precipitation of silver chloride in the highly colored hydrolysates (5) as a means of removing pigments which interfere with the visual titrations, it was found more desirable to resort to direct electrometric titration using the glass electrode. The latter procedure is not only simpler but is free from the possibility of losing amino acids as a result of coprecipitation. The values obtained after strong acid (9N H_2SO_4) hydrolysis were regarded as theoretical for complete hydrolysis of the proteins in the samples.

cystine if alkaline hydrolysis is employed (13). Racemization of the amino acids is responsible for further losses. Since methods are now available for the determination of the essential amino acids (2) and quantitative estimations of the requirements of man for these factors have also been reported (14), the essential amino acid makeup of all protein hydrolysates should be indicated.

TABLE 1

Essential amino acids in whole beef blood hydrolysate

AMINO ACID	CONTENT		
	On dry basis*	Calculated to 16.0% nitrogen**	Calculated to 13.8% nitrogen†
	%	%	%
Arginine	3.2	4.3	3.7
Cystine‡	0.6	0.8	0.7
Histidine	3.2	4.3	3.7
Isoleucine	0.4	0.5	0.4
Leucine	6.7	9.1	7.8
Lysine	6.3	8.5	7.4
Methionine	2.0	2.7	2.3
Phenylalanine	5.1	6.9	6.0
Threonine	5.0	6.8	5.8
Tryptophane	0.8	1.0	0.9
Tyrosine‡	0.8	1.0	0.9
Valine	8.8	11.9	10.3
Total essential amino acids	42.9	57.8	49.9

* Of the total solids, 85.5% were amino acids.

** The nitrogen content of most pure proteins is 16.0%. The values in this column give the yield of the various amino acids from the total proteins of the blood and enzyme preparation.

† The calculated nitrogen content of the amino acids derived from the total proteins of the blood and enzyme preparation is 13.8%. The values in this column indicate the essential amino acid composition of the hydrolyzed protein mixture after processing.

‡ Cystine and tyrosine are not essential amino acids in the true sense; however, since there are indications that they may substitute for methionine (1) and phenylalanine (19), respectively, they are included in the above list.

As has been pointed out in a previous paper (*J. Am. Dietet. A. 18: 685, 1943*), the efficient utilization of parenterally administered amino acids is dependent upon the presence of all the essential amino acids in sufficient concentration. Figures for these optimal concentrations are lacking since they are undoubtedly related to the human requirements for the essential amino acids and not until recently have reports indicating these requirements begun to appear (14–16).

EVALUATION OF A PROTEIN HYDROLYSATE AS A DIETARY SUPPLEMENT

The product developed in the course of our investigations was intended to be used as a *dietary supplement.* Cognizance, therefore, was taken of the quantities of essential amino acids contributed by the inadequate diet which was to be supplemented. Thus, if all such diets were able to supply sufficient quantities of a particular essential amino acid (for example, phenylalanine), then the protein hydrolysate might lack this particular amino acid and still effectively correct protein deficiencies. Likewise, if a particular amino acid (for example, lysine) tends to be lacking more frequently than others in the human dietary, it would be especially advantageous for the dietary supplement to furnish this amino acid in relatively higher concentration.

Block (14) has summarized the contributions of dietary protein according to classification of foods, as reported in the literature and as calculated from data covering the dietary habits in the United States from 1937 to 1941 (17). The nutritional evaluation of our blood protein hydrolysate is based upon Block's compilations (Tables 2 and 3) which show the absolute and relative contributions of protein from each of the main dietary sources of this nutrient. On the basis of analyses of essential amino acid content of a number of items in each food group, Block estimated the average per capita consumption of each of the essential amino acids. These values have been tentatively suggested as standards for optimal protein nutrition of the adult.

For the purpose of evaluating the beef blood hydrolysate as a dietary supplement, let us assume that the subject is subsisting on an inadequate protein diet characteristic of low-income groups, inmates of penal institutions, or the population in blockaded countries, etc. Of the protein in this hypothetical diet, 30 per cent may be considered to be derived from vegetable and 70 per cent from cereal sources. The total quantity of protein furnished, however, is arbitrarily set as identical to that consumed daily by the average American. Thus, the only inadequacy in such a diet with respect to the protein factor is a qualitative one, namely, its composition with respect to essential amino acids. The preceding review paper (*J. Am. Dietet. A. 18: 685, 1943*) and the report of Robinson and associates (18) have shown that quality and not quantity of protein

TABLE 2

Average American consumption of protein per capita, 1937–41

NUTRIENT	SOURCE OF PROTEIN					TOTAL	
	Dairy Products	Meats and Fish	Eggs	Beans, etc.	Cereals		
	lb./yr.					*lb./yr.*	*gm./day*
Protein-bearing foods	307.8	136.5	37.7	9.0	196.1	687	855
Actual protein content of the above	14.9	27.3	5.7	4.5	19.6	72	90
Arginine	0.64	1.78	0.40	0.24	0.80	3.86	4.8
Cystine	0.15	0.30	0.11	0.07	0.35	0.99	1.2
Histidine	0.37	0.44	0.12	0.08	0.45	1.47	1.8
Isoleucine	1.06	0.82	0.29	0.18	0.31	2.66	3.3
Leucine	2.24	3.00	0.79	0.36	2.28	8.68	10.7
Lysine	1.18	2.05	0.33	0.21	0.40	4.12	5.1
Methionine	0.48	0.93	0.28	0.10	0.49	2.28	2.8
Phenylalanine	0.66	1.23	0.34	0.26	1.02	3.49	4.3
Threonine	0.75	0.96	0.27	0.18	0.62	2.77	3.4
Tryptophane	0.22	0.33	0.09	0.07	0.15	0.86	1.1
Tyrosine	0.82	0.96	0.25	0.19	0.81	3.12	3.8
Valine	1.12	0.96	0.28	0.20	0.85	3.41	4.2

TABLE 3

Amino acid contributions of protein-bearing foods to the average American dietary

NUTRIENT	DAIRY PRODUCTS	MEATS AND FISH	EGGS	BEANS, ETC.	CEREALS
	%	%	%	%	%
Protein	21	38	8	6	27
Arginine	17	46	11	5	21
Cystine	15	31	12	6	36
Histidine	25	30	8	5	32
Isoleucine	40	31	11	6	12
Leucine	26	35	9	4	26
Lysine	28	50	8	5	9
Methionine	21	42	12	4	22
Phenylalanine	19	35	10	6	29
Threonine	27	35	10	6	22
Tryptophane	26	39	10	7	17
Tyrosine	26	30	8	5	29
Valine	33	28	8	5	25

is responsible for the appearance of signs and symptoms of protein malnutrition.

In Table 4 the supplementary value of the blood protein hydrolysate[3] to the hypothetical, inadequate diet is determined by its ability to supply the essential amino acids to the latter. The standards for reference in this evaluation are the quantities of each of the essential amino acids furnished by the average American diet (14). It will be noted that the inadequate protein diet fails to furnish 8 of the 10 essential amino acids in adequate quantities. Only in the case of histidine and phenylalanine were ample amounts available. Cystine and tyrosine, which may substitute under certain conditions for methionine (1) and phenylalanine (19), were also present in sufficient quantities. When the inadequate diet is supplemented with 25 gm. protein hydrolysate equivalent to 21.4 gm. amino acids, 5 of the 8 amino acid deficiencies are eliminated. In the case of the 4 amino acids (cystine, histidine, phenylalanine, and tyrosine) furnished by the inadequate protein diet in sufficient quantities, supplementation with the protein hydrolysate gave greater margins of safety.

TABLE 4

Supplementary value of the blood protein hydrolysate to an inadequate protein diet in furnishing essential amino acids as supplied by the average American diet*

AMINO ACID	FURNISHED BY INADEQUATE PROTEIN DIET (I.P.D.)			FURNISHED BY AVERAGE AMERICAN DIET (A.A.D.)	DIFFERENCE BETWEEN I.P.D. AND A.A.D.		PART OF A.A.D. FURNISHED BY 25 GM. HYDROLYSATE **
	Beans, etc.	Cereals	Total		I.P.D. with no supplementation	I.P.D. + 25 gm. hydrolysate**	
	gm./day			*gm./day*	*gm./day*	*gm./day*	*%*
Arginine	1.43	2.67	4.1	4.8	−0.7	+0.1	15
Cystine	0.41	1.17	1.6	1.2	+0.4	+0.6	15
Histidine	0.47	1.50	2.0	1.8	+0.2	+1.0	40
Isoleucine	1.08	1.03	2.1	3.3	−1.2	−1.1	5
Leucine	2.18	7.11	9.3	10.7	−1.6	+0.1	15
Lysine	1.29	1.34	2.6	5.1	−2.5	−0.9	30
Methionine	0.57	1.64	2.2	2.8	−0.6	−0.1	20
Methionine + cystine	0.98	2.81	3.8	4.0	−0.2	+0.5	20
Phenylalanine	1.57	3.40	5.0	4.3	+0.7	+1.9	30
Phenylalanine + tyrosine	2.69	6.43	9.1	8.1	+1.0	+2.4	15
Threonine	1.08	2.08	3.2	3.4	−0.2	+1.0	35
Tryptophane	0.45	0.50	1.0	1.1	−0.1	+0.1	20
Tyrosine	1.12	3.03	4.2	3.8	+0.4	+0.6	5
Valine	1.22	2.83	4.1	4.2	−0.1	+2.1	50

* The inadequate protein diets of the very low income groups; penal institutions, blockaded countries, etc., consist mainly of vegetable and cereal products. *See* text.

** A representative sample, containing 81.2% amino acids, 12.2% ash, 5.0% moisture, 1.2% carbohydrate and 0.4% fat, is used in this evaluation.

Deficiencies, however, in isoleucine, lysine and methionine persist. Very little isoleucine is furnished by the hydrolysate, nor does it completely compensate for the inadequacy of the poor diet with regard to lysine. Nevertheless it does not follow that the blood hydrolysate is not a good source of lysine, since the quantity suggested for use as a dietary supplement is actually equivalent to 30 per cent of that furnished by the average American diet. The present product, in fact, is one of the richest known natural sources of dietary lysine (2); that it does not fully meet the lysine deficiency indicates that all protein hydrolysates should be fortified with crystalline lysine or a lysine concentrate (20). Block (14) has pointed out that, whereas dairy and meat products are able to furnish 33 per cent extra lysine to the dietary, cereals contribute only 33 per cent of the recommended daily allowance of this amino acid. Thus the substantial reduction in the degree of lysine deficiency in an inadequate protein diet by supplementation with the present blood hydrolysate is worthy of emphasis.

The inadequacy of methionine which persists even after supplementation of the inadequate diet, is not too serious since cystine can substitute for methionine (1). When the over-all methionine plus cystine intake is considered, no deficiency in the sulfur-containing amino acids remains.

On the basis of experiments with growing albino rats, Rose (21) has determined the specific quantities of each of the essential amino acids which should be present in the diet. Block (14) has recalculated Rose's data, expressing the results in terms of a daily intake of 3000 calories. Comparison of Rose's figures (column 3, Table 5) with those of Block for the average American diet (column 5, Table 4) shows rather good agreement. The greatest discrepancy is in the smaller quantity of arginine recommended by Rose. However, Holt and associates (22) have recently demonstrated that, although man on an arginine-free diet fails to develop a negative nitrogen balance, there is a decrease in the spermatozoa count and cessation of motility.

TABLE 5

Supplementary value of the blood protein hydrolysate to an inadequate protein diet in furnishing recommended daily allotment of the essential amino acids*

AMINO ACID	FURNISHED BY INADEQUATE PROTEIN DIET (I.P.D.)	RECOMMENDED ALLOTMENT** (R.A.)	DIFFERENCE BETWEEN I.P.D. AND R.A.		PART OF R.A. FURNISHED BY 25 GM. HYDROLYSATE†
			I.P.D. with no supplementation	I.P.D. + 25 gm. hydrolysate†	
	gm./day	*gm./day*	*gm./day*	*gm./day*	*%*
Arginine	4.1	1.2	+2.9	+3.7	70
Histidine	2.0	2.4	−0.4	+0.4	30
Isoleucine	2.1	3.0	−0.9	−0.8	5
Leucine	9.3	5.4	+3.9	+5.6	30
Lysine	2.6	6.0	−3.4	−1.8	25
Methionine + cystine	3.8	3.6	+0.2	+0.9	20
Phenylalanine	5.0	4.2	+0.8	+2.0	30
Threonine	3.2	3.6	−0.4	+0.8	30
Tryptophane	1.0	1.2	−0.2	0.0	15
Valine	4.1	4.2	−0.1	+1.8	50

* The inadequate diet is the same as that described in Table 4.

** Estimated by Block (14) from the data obtained by Rose (1) in growth studies on the rat.

† A representative sample, containing 81.2% amino acids, 12.2% ash, 5.0% moisture, 1.2% carbohydrate and 0.4% fat, is used in this evaluation.

Table 5 shows the supplementary value of the blood protein hydrolysate on the inadequate protein diet described above in furnishing the recommended daily intake of the essential amino acids. It will be noted that of the 10 essential amino acids, 6 are present in suboptimal quantities in the inadequate diet. When 25 gm. blood protein hydrolysate is added, the histidine, threonine, valine and tryptophane deficiencies are removed and substantial reduction in the degree of the lysine deficiency effected, while the isoleucine balance is not materially improved. The extra quantities of the other amino acids furnish a greater margin of safety for these factors.

In order to demonstrate the *relative* merits of the beef blood hydrolysate as a dietary supplement, comparison is made of its essential amino acid content (after proc-

[3] *See* footnotes to Tables 4 and 5 which state the nutritional components of the hydrolysate on a percentage basis.

essing) with that of sources of protein recognized as excellent (Table 6). The amino acid values for the other proteins are taken from the data compiled by Block and Bolling (2). It will be noted that despite the fact that most commercially available protein hydrolysates (9, 12, 13) are prepared from casein, this protein is not included in the tabulation. Lactalbumin is definitely superior to casein in the general nitrogen metabolism of the adult organism (23). Because of this and in view of the superior value of one protein on another, it was considered advisable to list whole milk protein rather than casein alone.

TABLE 6

Comparison of the essential amino acid content of beef blood hydrolysate with that of recognized excellent sources of dietary protein

AMINO ACID*	BEEF BLOOD HYDROLYSATE	MEAT PROTEIN	WHOLE EGG PROTEIN	WHOLE MILK PROTEIN	YEAST PROTEIN	SOYBEAN PROTEIN
	%	%	%	%	%	%
Lysine	8.5	7.6	6.0	7.5	6.0	4.8
Isoleucine	0.5	3.4	5.3	4.4	3.4	4.0
Tryptophane	1.0	1.3	1.6	1.6	1.8	1.6
Threonine	6.8	3.7	4.9	4.6	5.0	4.0
Valine	11.9	3.4	4.4	4.5	4.4	4.5
Methionine	2.7	3.2	3.5	2.8	2.0	2.0
Histidine	4.3	2.1	2.4	2.5	2.8	1.8
Leucine	9.1	12.1	19.0	16.2	13.2	7.7
Arginine	4.3	7.2	7.0	4.3	4.3	5.3
Phenylalanine	6.9	4.5	5.6	5.7	4.1	5.7
Total	56.0	48.5	59.7	54.1	47.0	41.4

* The amino acids are listed in descending order of their probable deficiency in the human dietary. The first 5 are furnished by the inadequate protein diet (*see* Tables 4 and 5) in quantities less than those supplied by the average American diet or suggested as the recommended daily allotments. The 4 in the second group are present in the inadequate protein diet in sufficient quantities to satisfy one of these two criteria of adequacy. Phenylalanine alone is supplied in a sufficient quantity to meet both criteria. All values are expressed in terms of protein containing 16% nitrogen.

Instead of listing the amino acids alphabetically or in any other order lacking nutritional significance, they are presented in Table 6 in the descending order of their probable deficiency in the human dietary. The first 5 amino acids grouped together are furnished by the inadequate protein diet (*see* Tables 4 and 5) in quantities less than that supplied by the average American diet or suggested as the recommended daily allotments. The 4 amino acids in the second group are present in the inadequate protein diet in sufficient quantities to satisfy one of these two criteria of adequacy. Phenylalanine alone is supplied in sufficient quantity to meet both criteria.

The relative ratings of the hydrolysate and the proteins with respect to three important criteria are presented in Table 7. Whole egg protein furnishes the greatest quantity of the essential amino acids, followed by the beef blood hydrolysate, whole milk, meat, yeast, and lastly soybean protein. With respect to the ability of these materials to furnish the essential amino acids most likely to be deficient in the human dietary, the beef blood hydrolysate ranks first, followed by milk or egg protein, and then by yeast and finally meat or soybean protein. In furnishing the essential amino acids less likely to be deficient in the diet, egg protein ranks first, followed by milk, meat, the beef blood hydrolysate, yeast and lastly soybean protein.

The data in Table 7 demonstrate that whole beef blood is one of the most economical and efficient sources of protein for the preparation of an essential amino acid concentrate for use as a dietary supplement. Despite the processing, the beef blood hydrolysate contains almost the same quantity of essential amino acids as whole egg protein. The high cost of whole egg and meat proteins prohibits their use as a starting material for an amino acid concentrate. Even if this were not a deterring factor, the presence of appreciable quantities of extraneous material, particularly fat, would add complications. If whole milk, yeast or soybean were used, the proteins would first have to be isolated for the enzymic digestion, or the resulting product would contain a large quantity (more than 50 per cent) of inert material, particularly carbohydrate. The necessity for isolating proteins from such preparations prior to the enzymic hydrolysis would of course involve additional manipulations with a corresponding increase in the cost of manufacture. Furthermore, during the preparation of hydrolysates from these protein materials processing losses would occur, comparable to that noted in the preparation of the beef blood hydrolysate. Such losses would lower the ratings of these other materials as sources of the essential amino acids.

TABLE 7

Evaluation of beef blood hydrolysate as a source of essential amino acids for dietary supplementation

CRITERION	RATING					
	1	2	3	5	4	6
Total quantity of essential amino acids furnished	Whole egg protein	Beef blood hydrolysate	Whole milk protein	Meat protein	Yeast protein	Soybean protein
Furnishing essential amino acids most likely to be deficient in diet	Beef blood hydrolysate	Whole milk or whole egg protein		Yeast protein	Meat or soy bean protein	
Furnishing essential amino acids less likely to be deficient in diet*	Whole egg protein	Whole milk protein	Meat protein	Beef blood hydrolysate	Yeast protein	Soybean protein

* Includes also a consideration of the quantities of phenylalanine furnished.

EVALUATION OF A PROTEIN HYDROLYSATE AS A SOURCE OF ESSENTIAL AMINO ACIDS FOR PARENTERAL ADMINISTRATION

Amino acid solutions are administered parenterally for two purposes: (a) as a means of protein alimentation and (b) to supplant or supplement the use of human plasma in the treatment of patients suffering from various acute conditions such as shock, burns, hemorrhage, etc. These clinical applications of the amino acids have been discussed in some detail in the preceding review paper (*see* this JOURNAL for October).

When the essential amino acids are supplied to the organism entirely by the parenteral (principally intravenous)

route, it is essential that a well-balanced mixture be injected. Under such circumstances all the essential amino acids become equally important. If one is missing, nitrogen balance may not be attained so that poor utilization of all the other amino acids results (*J. Am. Dietet. A. 18: 685, 1943*). In Table 8 a comparison is presented of the essential amino acid content of beef blood hydrolysate with that of proteins of high nutritive quality from the standpoint of parenteral protein alimentation. The recommended daily intake of the essential amino acids is an average of the values drawn from the data of Rose (21) and Block (14).

Cystine and tyrosine, which are omitted from the table, are so insoluble at the *p*H of blood (7.4) that it is thought best to remove them from the protein hydrolysate, allowing an extra quantity of methionine and phenylalanine, respectively, to compensate for their absence. This recommendation is not in agreement with the conclusions of Madden and Whipple (24) that "methionine is not an efficient substitute for cystine in plasma protein formation, nor is phenylalanine for tyrosine." In view of the fact that serum protein formation is intimately linked with the general nitrogen metabolism of the organism (24, 25) the absence of the dispensable amino acids, the formation of new proteins from a mixture of only the essential amino acids occurs at the expense of a considerable fraction of the latter. Thus the dispensable amino acids in a preparation such as a protein hydrolysate, intended for parenteral use, are not of negligible importance since they supply essential amino nitrogen.

Examination of the data in Table 8 indicates that not one of the preparations listed is satisfactory for purposes of parenteral protein alimentation, 2 to 7 of the essential amino acids in a given food being supplied in quantities less than 80 per cent of the average of the two recommended intakes. The beef blood hydrolysate, even though having undergone processing, ranks favorably with the other materials whose processing losses, it should be noted, are not included since this information is not available. Supplementation of the blood hydrolysate with but 3 amino acids (isoleucine, methionine, and tryptophane) is required.

CONCLUSIONS

Evaluations of a beef blood hydrolysate compared with other sources of high-quality protein recognized as excellent, as a dietary supplement and as a means of supplying essential amino acids for parenteral protein alimentation, demonstrate that there is still much room for improvement in the protein hydrolysates available today (9–13). Deficiencies are apparent even in the case of the beef blood hydrolysate which compares so favorably with the best natural sources of the essential amino acids prior to processing, *i.e.* deficiencies in isoleucine and lysine if the material is to be used as a dietary supplement; and in isoleucine, methionine and tryptophane if the intended route of administration is parenteral. Supplementation of the hydrolysate with the synthetic amino acids does not appear to be the logical solution, because of the prohibitive cost and the relatively large amounts required. Whereas milligram quantities of the vitamins suffice to meet the daily human requirements, the essential amino acids must be supplied each day in amounts of from 1 to 11 gm. for optimal protein nutrition (14). A more promising approach (one that is receiving attention in our laboratory) is to isolate essential amino acid fractions containing large proportions of only certain members, those most likely to be missing in the basic protein hydrolysate. Supplementation of the latter with such relatively inexpensive concentrates should yield a product which approaches the

TABLE 8

*Comparison of the essential amino acid content of beef blood hydrolysate with that of proteins of high nutritive quality for purposes of parenteral protein alimentation**

AMINO ACID	RECOMMENDED INTAKE			BEEF BLOOD HYDROLYSATE	MEAT PROTEIN	WHOLE EGG PROTEIN	MILK PROTEIN	YEAST PROTEIN	SOYBEAN PROTEIN
	Based upon Rose's values (20)	Based upon Block's values (14)	Average						
	gm./day			*gm./70 gm. hydrolyzed protein*					
Arginine	1.2	4.8	3.0	3.0	5.0	4.9	3.0	3.0	3.7
Histidine	2.4	1.8	2.1	3.0	1.5**	1.7	1.8	2.0	1.3**
Isoleucine	3.0	3.3	3.2	0.4**	2.4**	3.7	3.1	2.4**	2.8
Leucine	5.4	10.7	8.1	6.4	8.5	13.3	11.3	9.2	5.4**
Lysine	6.0	5.1	5.6	6.0	5.3	4.2**	5.3	4.2**	3.4**
Methionine	3.6	4.0	3.8	1.9**	2.2**	2.5**	2.0**	1.4**	1.4**
Phenylalanine	4.2	4.3	4.3	4.8	3.2**	3.9	4.0	2.9**	4.0
Threonine	3.6	3.4	3.5	4.8	2.6**	3.4	3.2	3.5	2.8
Tryptophane	1.2	1.1	1.2	0.7**	0.9**	1.1	1.1	1.3	1.1
Valine	4.2	4.2	4.2	8.3	2.4**	3.1**	3.2**	3.1**	3.2**

* In this evaluation only the figures for the processed beef blood hydrolysate are presented; in the case of the other materials, processing losses are not included, the information not being available.

** This figure amounts to less than 80% of the average recommended intake.

their conclusions are not in accord with those derived from the studies by Rose and collaborators (1). The most recent report from Whipple's laboratory (26) which demonstrates the marked effectiveness of intravenous injections of the 10 essential amino acids in promoting serum protein formation, fails to support their earlier conclusion with regard to the alleged nondispensability of cystine and tyrosine.

As stated in the footnote to Table 8, the quantities of the essential amino acids listed are those derived from the hydrolysis of 70 gm. of various proteins (calculated to 16 per cent nitrogen). An intake of 70 gm. protein is less than that supplied by the average American diet (90 gm.) but represents a satisfactory amount for the adult, according to the Food and Nutrition Board, National Research Council (27). It is desirable that the smallest quantity of hydrolyzed protein necessary for optimal nutrition be injected. In this connection the so-called dispensable amino acids also play an important role. The tissue proteins, which are replenished as a result of parenteral protein alimentation, contain both essential and non-essential amino acids. While the latter must also be included in the synthesis of new protein, the animal organism does not require that they be ingested as such. In

theoretical ideal for whatever use it is to be put. An excellent beginning in this direction is the lysine concentrate of Block (20).[4]

It is not satisfactory merely to prepare a protein hydrolysate containing all the essential amino acids. The quantitative factor, concerned with the absolute and relative amounts of each, must be considered, as well as the desirability of having a certain fraction of the mixture in the form of the dispensable amino acids. The protein hydrolysates available today are as yet not completely satisfactory, either as dietary supplements or as sources of essential amino acids for parenteral alimentation. The purpose of the present discussion is to stimulate further studies in the direction of improving existing products. Very little is gained at present by comparing them with saline and glucose solutions from the standpoint of unlimited supply, low manufacturing costs and ease of administration (28). In the preparation of a protein hydrolysate, one must deal with a mixture of as many as 22 organic compounds, some of which are unstable to acid, some to alkali, some giving rise to toxic amines and phenols during bacterial decomposition, some no longer nutritionally effective as the optical isomer, some insoluble and some readily adsorbed during processing. Even these do not complete the list of the factors which must be controlled in preparing protein hydrolysates. In view of the above and the difficult analytical techniques in determining concentrations of the essential amino acids, it is premature to draw comparisons between a simple solution of a crystalline inorganic salt or of a single crystalline organic compound and an amino acid concentrate.

Only in the case of amino acid preparations which are intended for use as natural antacids, need there be no analyses for essential amino acid content. The buffering capacity of these compounds bears no relationship to their importance as essential dietary factors for growth and maintenance. Thus, in the case of such products it is sufficient simply to conduct control tests of comparative titratable alkalinity versus the present popular antacids, such as aluminum hydroxide, magnesium trisilicate, calcium or magnesium carbonate, sodium bicarbonate, and intact protein.

[4] While the present paper was in press, an amino acid concentrate was obtained of which 50 per cent was isoleucine. The addition of this preparation to the basic blood protein hydrolysate eliminated the isoleucine deficiency.

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Amino Acids Parenterally in Treatment of Burns, etc.

The significance of protein to the body has been universally recognized by chemists, physiologists and physicians. However, until recently nothing could be done to supply this essential to persons who were unable to take an adequate amount of protein by mouth. The ability to furnish protein to the body parenterally by the use of amino acids is a real advance in the field of nutrition.

In operative cases the assurance of an adequate supply of protein is most important, first, to protect the liver from possible toxic effects of anesthesia; second, to prevent tissue edema, which interferes with healing of the wound; and, third, to supply the essential nutrients required for tissue repair and regeneration.

In the nonhealing ulcers and burns there was improvement in most cases after amino acid solution was given. The amino acids were not supplemented with vitamins because of the difficulty which would then arise in interpreting the results. For practical therapeutics, however, vitamins C and D should be used in conjunction with the amino acids to treat poorly healing wounds, ulcers and burns.

The clinical improvement of the patients with muscular dystrophies was quite striking. Problems still to be solved are how the amino acids produce this effect and why a relapse occurs when the amino acid therapy is discontinued.—*Altshuler, S. S., Sahyun, M., Schneider, H., and Satriano, D.: Clinical Use of Amino Acids for the Maintenance of Nitrogen Equilibrium. J.A.M.A., 121:163, 1943.*

I ASK YOU TO UNDERSTAND[1]

CLAUDE R. WICKARD

NUTRITION and diet stand for something that has rapidly become a strong and significant force in the world. As nutritionists and dietitians, you are at last coming into your own. And as your influence grows, so do your responsibilities and opportunities.

It was only a few years ago that diet was a very dull word. It applied mainly to two classes of people—those who were so sick that they had to eat special food under a doctor's orders, and those who were so fat that they could no longer eat just for the fun of it. In both cases, the word diet had unfortunate and painful associations.

In the case of crops and livestock, we knew better. Farmers didn't use the word diet—but what the word stands for was part of their everyday knowledge, and they took it mighty seriously. Farmers knew, for instance, that plants had to be properly nourished, and they spent a good deal of time and effort—and money—getting the right combination of fertilizers, which means nothing in the world but a balanced diet, for crops. They knew their animals had to be properly nourished, too, and many a farmer sat up late at night figuring out balanced rations for a herd of cows.

The connection between proper food, good condition (which means health), and productiveness was thoroughly familiar to wide-awake farmers because it paid to know about these things if you produced crops or livestock.

But very few people, except the nutritionists and dietitians, knew that it paid also in the case of human beings. The farmer would have laughed at you if you had suggested that he ought to spend as much time working out balanced rations for himself and his family as for his hogs or his cattle.

PROGRESS IN HUMAN NUTRITION

But in recent years we have had a period of rather dramatic developments in nutritional knowledge. I don't need to outline the main steps, because you are even more familiar with them than I am. No small part of our new knowledge has come from the biochemists, and I am proud to say that some of the notable contributions were made by people working in our agricultural experiment stations, often primarily in the field of animal nutrition. Human and animal nutrition, of course, overlap a great deal, since every human being is, fundamentally, an animal organism. Also, more and more members of the medical profession have become intensely interested in nutritional research, and their contributions are helping to broaden the whole field.

The net result of all the recent progress has been to give us a much more far-reaching and detailed conception of the importance of nutrition to human beings than we ever had before. We knew we had to have enough fuel to keep the muscles working, including those that pump blood and operate the lungs. We knew we had to have enough protein to build new tissues and repair worn-out ones. But now we know that nutrition also reaches into every nook and cranny of our life processes. It affects our nerves and our eyesight, for instance—and even, in some cases, our emotional reactions and temperament. Certainly it has a very great effect on our general health and our capacity for sustained work over a long period of years.

In other words, as Dr. Henry C. Sherman has put it, the modern knowledge of nutrition has given us a new kind of control over our lives. We can't, at present, do a great deal to control human life through genetics, as we can when we breed superior plants and animals; the whole business of inheritance is too complicated, in the case of human beings, to be subject to much control. But we can take the inheritance with which a human being starts and help him to develop to his full capacity through good nutrition. And the possibilities in that direction are startling, for the majority of the world's two billion human beings have never had enough of the right kind of food to develop to their full inherited capacity.

NUTRITION IN THE WAR PROGRAM

That is essentially the picture as I see it. The nutrition scientists, not only those working with human beings, but those working with livestock and even with plants, have now proved beyond any doubt that nutrition is an enormous power for good. And that, in a nutshell, is why nutrition has been taken so seriously in this war. Our military leaders have given more attention, and a different kind of attention, to the diet of soldiers than ever before. Our statesmen—yes, and even the dictators—are making the diet of workers, and of whole populations, a matter of national policy in a way that was never true before. And more people than ever before are thinking about nutrition, and trying to find out about it, and to apply what they find out in their daily lives.

The reason, of course, is simple. In war, especially in modern warfare, we need to develop our fighting capacity, our production capacity, and our general stamina to the highest possible level. War drives home to us the fact that it pays to have people properly fed—in a far bigger sense than it pays the farmer to have his livestock properly fed. For instance, back in May 1941, we were startled at the National Nutrition Conference when General Hershey revealed estimates which indicated that as high as 15 per cent of the men examined by Selective Service up to that time had been rejected for causes due directly or indirectly to nutritional deficiencies. That was a shocking statement to be made in a country which we had always complacently referred to as the "best fed nation in the world."

Facts like that have put you nutritionists and dietitians on the map in a big way. Your advice carries weight in the councils of governments. And the reason it does is that you have the knowledge to back it up.

Now the question that interests me is—are we going to forget all about this after the war?

Here in the United States our agriculture is producing at a greater rate than ever before. In spite of difficulties in getting manpower, materials, equipment, and transportation, our farmers have been breaking all records year after year, even before Pearl Harbor. This year's total food production is about one-third larger than the 1935–39 average.

As a result, we have been able to feed our soldiers better than any soldiers have ever been fed before. We have been able to supply sizable amounts of food for our allies. And on top of that, there are probably more people properly fed, and fewer people underfed, in the United States than before the war began. Our per capita consumption of most nutrients is equal to what it was in the prewar period 1935–39, and for some important nutrients it is higher. As a matter of fact, this year's civilian per capita consumption of all foods is expected to average somewhat above the 1935–39 level. All of this, I am certain, has had a great deal to do with the victories we and our allies have won, and shall continue to win.

[1] Address by the Hon. Claude R. Wickard, Secretary of Agriculture, before the American Dietetic Association, Pittsburgh, October 19, 1943.

PRODUCTION AND DISTRIBUTION OF FOOD

How did this happen? We not only have increased our food production, we have also had a more equitable distribution of food. That has been accomplished because there are fewer people with inadequate purchasing power and because food is provided at reasonable prices through price control and rationing.

But do we have to have war—do we have to be engaged in the business of killing—to feed people properly? Are we to say that a man should be properly fed while he is a soldier—but when he becomes a civilian again it doesn't matter? Or that a worker should have the right food when he is turning out weapons—but it isn't important when he is turning out the comforts of peace?

I am sure that we are going to maintain in this country from now on that good diet is as important to the peacetime civilian as it is to the wartime soldier. And fortunately we now have the physical means to provide the better diet in either peace or war.

The scientific developments I have mentioned have opened up new possibilities for mankind to better itself through nutrition—the people of any group, any nation, or the world as a whole. And under certain conditions I think that world agriculture can produce enough to give all people the food they need for life and health. I don't say we could do this all at once by any means, but we can now confidently look forward to the day when enough food can be produced to feed all people adequately.

The important thing is that this could not have been said in the past. What has made it possible to produce enough food has been modern agricultural science. Until science came along and showed us how to multiply production per man by mechanization—and how to multiply production per acre by better soil management, better plant and animal nutrition, and the development of improved stocks through breeding—it would have been impossible to feed the world adequately. Many people were doomed to starvation and undernourishment. Now I believe that is no longer true.

Today the whole world is perhaps more conscious of the problems of food and nutrition than ever before. There are several reasons for this. First, as I have pointed out, the war made food and nutrition—and agricultural production—matters of life and death. Second, millions of people, starved during the war, are thinking about food more than about any other one thing in life—and this will be even more true in the period immediately after the war. Third, President Roosevelt and Prime Minister Churchill have dramatized the whole question of adequate food, and brought it sharply to the attention of the world, in their emphasis on freedom from want as one of the great and necessary aims of our time.

Fourth, the President called the United Nations Conference on Food and Agriculture at Hot Springs last spring. There, for the first time in history, representatives of practically all free nations sat down to think and plan about food and nutrition and agriculture. There at that conference were sown the seeds for producing a world-wide program for better nutrition. We want to play our part in contributing to the advancement of that program. Making it a success is one of the best ways of having a satisfying and permanent peace. And fifth, you dietitians have made the whole world conscious of the importance of being properly nourished. We realize through your efforts that food must not only satisfy the appetite—it must satisfy the body and mind.

FOOD IN THE POSTWAR PERIOD

I think there is no doubt that this question of adequate food will continue to be in the forefront of our thinking for some years to come. Urgent needs will make it impossible for us to escape the problem, nationally and internationally.

Our agricultural plant in the United States is now greatly expanded. After the war, when shortages of manpower, equipment, and materials begin to be less hampering than they are now, we should be able to produce even more.

What are we going to do with that expanded production capacity? Are we going to let it collapse for lack of effective demand, with untold hardship for farmers—including the farm boys who will be coming back from the battlefields—as we did after the last war? Or are we going to take positive action to maintain effective demand and see to it that we avoid starvation in the midst of surpluses?

If we are going to do the latter, we must plan now to keep up purchasing power by providing adequate employment for millions of returned soldiers and more millions of workers who will no longer have war jobs to do. Only a man with a job carries a full lunch pail and is able to buy the meat and the milk and the fruits and vegetables that his children need for growing bodies. In other words, we must have full employment if we are going to have full farm production and the highest possible nutritional standards. The greatest social crime, and the greatest waste, is to fail to produce, either in the factories or on the farms, up to that limit which is compatible with the conservation of our national resources.

High rates of employment provide good purchasing power with which to obtain good diets. But a comparatively high rate of employment does not ensure that there won't be some who will not have good diets. They may be temporarily unemployed. They may have large families and small incomes. Some people do not know what constitutes a good diet or how to obtain a maximum of nutrition with a meager income. Whatever may be the reason for being undernourished, we know that people who are undernourished are unproductive, unhappy people, who are often subject to forces that make for unrest, discontent, and even crime. Often they become sick people and frequently they become inmates of our hospitals and institutions.

I think that we all agree that undernourishment is most harmful to children. That is why I hope that one of the improvements which will accompany the peace will be an expansion of the school lunch program. That program offers a way of making it possible for every school child to have at least one good nutritious meal a day, through a splendid type of cooperative effort upon the part of local welfare people and state and national organizations. I am of the opinion that if it is a wise public policy to see that each child is educated and trained for citizenship, it is also good public policy to see that he can obtain the sort of diet that will make him vigorous and strong.

But the question, of course, always arises as to how we are going to pay for a program that will provide proper diets for all our citizens. My answer is that it is not a choice between the cost of such a program and no cost. I believe a program of proper diet is less costly than one involving people who are weak, unhappy, and unproductive because they are unable to obtain the proper amounts and kinds of food. Especially is that true when land and labor will be wasted if it is not used to produce such food.

THE DIETITIAN'S PART IN THIS PROGRAM

You who are sitting here in this room will have a more vital interest in all this than most people. It is the work

of your associates in the laboratories and clinics that has been responsible for making nutrition a matter of national concern in many countries, and now a matter of world concern. It will be up to you to pitch in and work as a team with agricultural producers, processors, and distributors to the end that hunger may be wiped out and the world may no longer be disgraced with millions of ill-fed and starving people.

My purpose in talking to you today can be put very simply. It is to ask you to realize the dynamic part that will be played by your profession in the developments of the future. It is to ask each of you to find where you and your work fit in the tasks ahead. I can't tell you where you fit and what contribution you can make; it is up to each of you to find out for yourself. But I can tell you that there is a tremendous amount to be done if we take seriously any such job as achieving freedom from want. And we simply must do that.

We shall need a great deal of educational work—a great deal of research and its application to difficult practical problems—a great deal of understanding and cooperation in adjusting our economic and social institutions so that consumers can get what they need, and farmers will be able to produce it.

As dietitians, you are especially interested in the possibilities for long-range domestic programs. But you should also be interested in international plans for cooperation between countries. In the latter field I would particularly mention such efforts as those represented by the United Nations Relief and Rehabilitation Administration and by the United Nations Conference on Food and Agriculture. Study these efforts; find out what they are about; see what the issues are, pro and con; and if you agree, help the work along in every way you can.

Next to the winning of this war, there is nothing more important to us right now than the kind of world we are going to have after this war. If we want a world in which lasting peace is possible, we shall have to plan and work for it; and especially, we shall have to find ways that are better than war for satisfying the fundamental needs of peoples and nations. Every step we take in that direction will help. The time to begin is now.

Facts About Fish

In a recent release by OWI, Americans are urged by the Office of the Coordinator of Fisheries to make the best and most complete use of available fish supplies, and to try some of the unfamiliar varieties now on the market. To meet problems created by the war, the Office of the Coordinator of Fisheries was established in July 1942 to serve as a liaison organization between the industry and the numerous government agencies involved. Secretary of the Interior Ickes was appointed Coordinator of Fisheries, and Ira N. Gabrielson and Charles E. Jackson of the U. S. Fish and Wildlife Service were made Deputy Coordinators. Considerable improvement in the total fish supply has come about as a result of a year's joint efforts of the fishing industry and the OCF.

In the past, crews of ocean-going fishing boats tossed overboard such fish as skates, sharks, sea robins, mussels, and squids. Now, however, these edible species are appearing on the market and will continue to be available if they prove to be profitable. The public, faced with a meat shortage and scarcity of familiar fishes, is more willing to try the new species. Following is some information on the less familiar kinds of fish now available:

Of the so-called "inland fish," the neglected carp is so abundant throughout the Middle West that sportsmen regard it as a nuisance, but properly prepared, this fish is an excellent food, considered a delicacy by Europeans. The related buffalo fishes are also available in quantity as are the sweet-meated, though bony, suckers. The burbot, a wholesome food fish closely related to the familiar cod, is present in some quantity in the Great Lakes; sheepshead, bowfin, and gar represent virtually untapped food resources easily available to the interior of the country.

Of the ocean species, skates, long popular in Europe, have been little used here. The "wings" are the edible portions from which a white meat, excellent in a salad or casserole dish, is taken. Fresh shark steaks are sometimes compared to halibut. Kippered or lightly smoked shark resembles smoked salmon. The sea mussel, highly esteemed as food almost everywhere in the world except the United States, seems destined to become popular here. It can be cooked and served in almost the same way as the oyster and the clam. A relatively small market for the mussel has always existed in such cities as Boston and New York. Its meat is golden or cream-colored and tastes somewhat like the longneck, or soft clam.

Still more or less in the field of marine curiosities as far as the general public is concerned are squids, periwinkles, conches—all related to oysters and clams—and sea urchins, relatives of the familiar starfish. Americans of recent European or Asiatic origin regard these creatures as delicacies. Gourmets recommend that squids be skinned, dressed (they contain only a small amount of inedible matter), gently stewed, and served with tomato sauce. Baskets of periwinkles and conches are to be seen in New York's Fulton Fish Market and other seafood centers. Sea urchins, somewhat resembling chestnut burrs, are also appearing in some markets. The only edible portion is the orange-colored roe, found by breaking open the shell.

The following booklets on cooking the above-mentioned varieties of fish are available from the Publications Office, Fish and Wildlife Service, Merchandise Mart, Chicago: "Cooking Carp," Edith E. Hopkins and Catherine M. Ritchie; and "How to Cook the Burbot," by the same authors. "Wartime Fish Cookery," by Elizabeth Whiteman, is available from the Superintendent of Documents, Government Printing Office, Washington.

NELL CLAUSEN

President of the American Dietetic Association

Editorial

NELL CLAUSEN, PRESIDENT OF THE AMERICAN DIETETIC ASSOCIATION

One after another the women who have been selected to head the American Dietetic Association have met the needs of the hour and grown in stature as befits the high honor of the presidency. Each, during her term of office, has contributed unmistakably and permanently, and in her own characteristic fashion, to the steady advancement of the profession. It is in keeping with democratic principles that this should be so, and that the benefits of changing viewpoints, and changing emphases, as a result of the specialized interests of each president, should accrue to the Association year after year.

And so, in the midst of a second world war, it is fitting indeed that one whose youthful imagination was fired by the need for dietitians in the first world war should be selected as the Association's twentieth President. Nell Clausen, 1943–44 President of the American Dietetic Association, is by birth and education an Oklahoman. She grew up in Stillwater and received her degree in home economics from the Oklahoma A. & M. College. Her background, therefore, is chiefly that of the Middle West, the area of the country known as "the backbone of America," an important segment of which, Wisconsin, is the state of her adoption.

Sandwiched in between Oklahoma and Wisconsin (and here we'd best carry the sandwich simile no further) was a period as student dietitian at Bellevue Hospital, New York, in preparation, supposedly, for service overseas. The war ended before her course was completed but an assistantship later at Bellevue was followed by two years as staff dietitian at Walter Reed Hospital, Washington, where Miss Clausen's ambition to "try the Army" was realized and where she acquired a sympathetic understanding of the problems of the dietitian in an Army hospital. Her next venture, as the owner-operator of a restaurant catering to a "special diet" clientele, permitted sampling of a commercial business activity which serves so well to season the successful dietitian's sum total of experience.

But it was in working for the physical betterment of children that Nell Clausen eventually found her forte. Since 1925 she has been with the Milwaukee Children's Hospital, where her personal charm, allied with her administrative ability to translate theory into practice, has contributed to a most successful career. In her own words, she never loses her keen interest in watching an ill child respond to good dietary care, in teaching parents the essentials of good nutrition, in helping children to form good health habits, and in assisting in research.

While by her own admission she is "definitely not a crusader," because of her administrative ability she finds herself taking a leading part in organizing community activities which concern nutrition and child health. That she nicely balances a sense of realism with her idealism is indicated by the fact that she is known as a "good buyer." It augers well for the Association that she seems to have everything that makes a good president, including courage, diplomacy, impartiality and generosity, and above all, balanced self-control. May the Association under its President be "of the greatest good to the greatest number" in 1943–44.

VETERANS ADMINISTRATION STUDENT DIETITIAN TRAINING PROGRAM[1]

To combat the growing shortage of qualified dietitians for current vacancies, and to meet the need of additional dietitians in connection with the expansion of hospital facilities to care for patients from the present war, the Veterans Administration is instituting a student training program in its 1750-bed general hospital at Hines, Illinois.

The course will be under the direction of Kathryn A. McHenry, Chief Dietitian, who will be assisted by one full-time instructor, in addition to the present dietary staff of one Assistant Chief, three Head and eight Staff Dietitians. All details of the program have been worked out in cooperation with the Educational Director of the American Dietetic Association in order that the course may conform fully to the standards approved by the Association. It will be one year in length, including seven weeks of affiliation to provide for two weeks' training in private tray service and five weeks in child feeding. Preliminary arrangements have been made with the University of Chicago Clinics and Michael Reese Hospital for the necessary affiliation.

The number of students will be limited to twelve at the present time although future plans provide for the expansion of the program to include the enrollment of students semi-annually with arrangements for supervised practice during the latter part of the year's training in the three types of Veterans Administration Hospitals, including those for patients undergoing treatment for tuberculosis, neuropsychiatric conditions, and general medical and surgical disabilities. Appointments will be made at $1440 per annum with payroll deductions during the seven weeks of affiliation.

Applicants who meet the educational requirements of the American Dietetic Association for approved student dietitian training will be enrolled by the United States Civil Service Commission, Washington, until the needs of the Veterans Administration are met. Upon successful completion of the course, students will be eligible for positions in the grade of Dietitian in Veterans Administration hospitals in all parts of the United States.

Nutrition and the War

FEEDING THE AMERICAN SOLDIER[2]

MARY I. BARBER

The American soldier must have food—food that cheers and warms him—food that renews his fighting strength and spirit—food that satisfies his hunger—food that brings to mind his home and reminds him that he is struggling to

[1] *Editor's Note:* This program, according to Dr. Clayton L. Wood, Acting Medical Director, has been approved by the Veterans Administration. Requests for any further information should be addressed to Grace Bulman, Superintendent of Dietitians, Veterans Administration, Washington 25.

[2] Presented before the American Dietetic Association, Pittsburgh, October 20, 1943. Miss Barber is Food Consultant to the Secretary of War, Office of the Quartermaster General, Army Service Forces, and Director of Home Economics, The Kellogg Company, Battle Creek, Michigan.

maintain just such a common need as three meals a day—three meals a day eaten in peace; eaten at a table with the ones he loves best—eaten without fear, eaten with freedom from want.

The responsibility of the Subsistence Branch of the Quartermaster Corps is to provide food for our soldiers, now in so many parts of the world. Think of Attu. "The fog which hangs over Attu is a strange fog. The mountains ringing the valleys are topless mountains because of it, and the men do not know what they see and what they only *think* they see. The fog is a cold blanket, the mountain slopes are slippery with green moss and mud." (*Mist From Attu*, by William L. Worden.) The cold penetrates through the clothing and even one's bones feel cold. The one release from discomfort is food.

The forces landing on Attu carried with them the K and D rations. The K ration has been developed for use in combat areas where it is not possible to carry and cook quantities of food. It must meet definite standards. In order of importance these standards are: palatability, as high nutritional quality as possible, keeping quality, and economy of space with as little weight as possible.

For two days after landing on Attu, our soldiers lived on the K and D rations. The terrain is rugged, the climbing steep; uniforms and boots were wet; the cold became colder as altitude increased. Every pound of food, along with cooking utensils and stoves had to be carried up the slippery, tortuous paths by soldiers from the Quartermaster Corps.

The first food to reach the troops was ration C. Some men had small alcohol stoves so that water could be boiled for coffee or hot lemonade, and the meat units could be heated, if time from battle allowed this to be done. The little stoves had to be buried in the mud and shields put around them to hide their dim light. Later, the large, heavy gasoline burners from the Army field ranges arrived. From then on, hot coffee and cocoa were available at all times for those who could get to the improvised field kitchen.

Several days later other food supplies arrived: canned meat and canned and dehydrated vegetables, fruit juices and soups. All these items were carried by men, but at last our soldiers, miles from the supply base, were eating hot, nourishing meals.

Contrast a tropical combat area with Attu. Here the heat seems unbearable. Uniforms are soaked with perspiration; water may be scarce and what there is may be warm and taste queer. The problems of the Quartermaster Corps are many and complicated. Every precaution must be taken to prevent food spoilage. Each item shipped must withstand the terrific heat of the tropical sun and the dampness due to the rains. In the tropics, as in the Arctic, rations K and D are of great importance. K is the ideal combat ration, the food on which men fight and fly. It is the ration which keeps body and soul together and gives our soldiers strength over that of the enemy.

Wherever bases are set up back of the combat areas the Quartermaster Corps establishes kitchens and bakeries such as you see in any post, camp or station in this country. There may not be china plates and cups, but the food that goes into the mess kit pan has been purchased with as great care. The meals are nutritionally adequate, even if prepared only from nonperishable foods sent from America. However, wherever possible the Quartermaster Corps purchases fresh food to supplement the field ration. We know that in some parts of Africa, at certain times of the year, there are fresh fruits, tomatoes, carrots, squash and even French artichokes.

Our soldiers should return home with new food likes and more cosmopolitan appetites. American soldiers are not enthusiastic vegetable-eaters. One very amusing letter came from Africa saying that squash had come in such quantities that the mess officers were developing claustrophobia from the piles of it in the storerooms. At their most desperate point, the season ended and the problem solved itself.

Many of you have sons and brothers in foreign service, but more of you know soldiers in the United States. The Quartermaster General has food problems here, too, although they are more easily solved than in Iceland or Guadalcanal. Looking back at menu-making nearly three years ago, the work was comparatively simple. Our country was one of food abundances and surpluses; now it is one of unavailabilities and shortages. Every effort is being made to conserve food on all Army posts. The chief improvements are a change in the number of rations issued and a new Food Service Division. Formerly, one ration was issued daily for every man assigned to a mess. Now, rations are issued only for the men who actually eat their meals in the mess. The mess officer can estimate, from experience, how many will be absent because of sick call, trips to town, or furloughs. This has cut down over-preparation of food.

We also know more about what foods the soldiers will eat, and the amounts they will eat. The unpopular foods are now served less often and in smaller quantities. The Food Service Division aims to improve the cooking, service and conservation of all foods. Bakers and Cooks Schools, field bakeries, storage of perishable and nonperishable items, and special courses in the preparation of overseas rations all come under this Division. Its influence will be great and its ultimate goal is to provide food for our Army which will be better than it has ever been before.

There are many stories which show the ingenuity of American soldiers. One tells how the aviators in the tropics carry as many canteens full of water as possible, so that the water will chill or even freeze in high altitude. This water is precious indeed, because on the ground its temperature may be as high as 98° F. As a nation, we like ice water and doing without it is one of the discomforts our men are enduring. Men in the desert have learned that tiny piles of sand saturated with gasoline prove efficient for boiling water and heating food.

A doctor, back from fourteen months in the Arctic, said that the members of his mission—of all things—longed for combination salad and their greatest regret was that they had not taken pop-corn with them. They hungered for something crisp to eat. These men, on their return trip, landed by plane in northern Maine in winter, hurried to a restaurant and ordered combination salad. It tasted as good as they thought it would!

Another "cold" story is the way in which these men made ice cream while in camp. They mixed powdered milk, eggs, sugar, water and vanilla in a dish-pan. One man held the pan, another stirred—and forty below zero and a twenty-mile wind did the rest in five minutes. Our American habit of eating ice cream cannot be downed, even in subzero climates.

On Guadalcanal, when there was no water, the soldiers knocked green cocoanuts from the trees and drank the milk. On Bataan, the Quartermaster Corps cut and threshed rice so that the troops could have food as long as possible. Thousands and thousands of other heroic stories will never be told—stories which concern food.

Food is the universal link between the fighting front and the home. Food is symbolic and is tied up in our minds with family feasts and national holidays and holy days.

Up-to-Date . . . Practical . . . Educational

At this time when the need of the best of physical fitness, because of the added work and strain of a war-torn world, is greater than ever before, come food shortages, rationing and higher prices to complicate the job of feeding families adequately. "Stamp And Money-Stretching Meals" is a new collection of tested recipes which can be of great assistance in providing appetizing, fine-flavored yet inexpensive meals that are most wholesome and nourishing.

The dishes made from these recipes are more wholesome because, calling for undiluted Irradiated Pet Milk or for Pet Milk diluted with less than an equal amount of water or other liquid, they include more whole milk substances and an extra amount of vitamin D.

The food costs less because Irradiated Pet Milk costs less generally than ordinary milk. Used in place of cream and of whipping cream, it costs less than cream—much less than whipping cream used to cost when it was obtainable.

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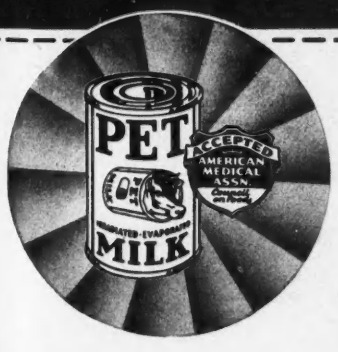

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Thanksgiving will soon be here and the Quartermaster Corps realizes that every soldier in our Army, whether in this country, in the Arctic, the Pacific—wherever he may be—will feel nearer home if the traditional feast is spread.

So turkeys are on their way across the seven seas, either frozen or canned, and with them will be served mashed potatoes (dehydrated), cranberries (dehydrated) and as many other typically American dishes as possible. To make this possible is more than a gesture—motivated by the sincere desire of the Subsistence Supply officers that each soldier may thus briefly relive his memories of a happy home life, free from want and free from fear.

Many of you have read about the cemetery in Guadalcanal where Protestant, Jew and Catholic are buried side by side, each grave marked with a concrete block. Preserved in this block is the soldier's mess kit—the most intimate personal belonging he had through all his fight for the freedom of the world. Primitive people used to bury the soldier with his weapons—the civilian with his personal possessions so that he would feel at home in another sphere. Today the mess kit, significant of the strength and courage gained through food, is the symbol both of the home and the battle field. It means food—food that will sustain and nourish our soldiers while away from their families and usual environments and keep them adequately fed until the guns are stilled and life again means planning for a lasting peace.

A PLAN FOR THE RECRUITING OF DIETITIANS

ELIZABETH PERRY[1]

The Cleveland Dietetic Association has planned a vocational guidance program for the recruiting of student dietitians—a program which is not limited to one day's activities. Two committees are working on this—the Recruiting Committee and the Program Committee.

The work of the Recruiting Committee is to interest students in dietetics as a profession and to extend invitations to attend an all-day meeting planned for this coming March, at which the student will have an opportunity to see the dietitian at work and thus obtain a clearly-defined picture of her responsibilities, the importance of her work, and the opportunities open in the field of dietetics and nutrition.

The preliminary work of the committee is planned as follows: With the aid of the vocational directors of high schools, junior colleges, and universities, meetings will be held with the students, at which invitations to the all-day meeting will be extended and dietetics as a profession discussed. The dietitians presenting this program will have attractive and simplified pamphlets available for distribution on the subject of dietetics as a profession. Publicity in the local papers is also planned for this period of recruiting.

The morning session for the all-day meeting which is being planned by the Program Committee will be held in the Cleveland College Auditorium of Western Reserve University. Invitations to this meeting will also be extended to the parents of the students. Speakers will include a hospital administrator, director of a nurses' training school, representatives from the Public Health Department and the Army, and "Exhibit A"—a dietitian in the uniform of a Medical Department Dietitian, Army of the United States.

Displays showing the activities of the dietitian are planned for the morning session. Other displays will show the activities of the student dietitian and the college student majoring in the field of foods and nutrition preparatory to entering the field of dietetics.

In the afternoon, the dietary department of each hospital will hold "open house" so that the student may see the dietitian at work. Prior to this, participating dietitians will confer in order to ensure the authenticity of all information given out at each hospital on college and approved course requirements.

It is our hope this program will arouse the interest of the public in dietetics as a profession and serve to swell the student body majoring in courses preliminary to embarking on dietetics as a career.

[1] Cleveland City Hospital.

A HOSPITAL TRAINING PROGRAM FOR NEW EMPLOYEES[1]

WILMA F. ROBINSON

One of the most important questions facing the dietitian today is, "How can I find the time to train my new employees adequately?" We are kept busy with innumerable details concerning food supplies and disrupted procedures. Then a new employee appears, usually a woman, and we greet her with mixed feelings; it is wonderful to have one more person to help but we wish she knew just what to do without having to be told.

Our Personnel Department has been of invaluable assistance in meeting this problem. When the new employee reports for duty she goes to the Personnel Office where she is given a locker key. The personnel director takes this opportunity to discuss with the employee hospital insurance, the withholding tax, and the payroll allotment plan for the purchase of war bonds. The fact that she is entering an essential industry and is aiding in the war effort by contributing her services to a hospital is stressed.

The employee is then given a booklet of general information about the hospital, including rules and regulations affecting all employees. This booklet is called "The Quiz Hour." It contains answers to the following questions: For whom am I working? Where do I belong in the scheme of the hospital organization? What do I do my first day? What is my status if I am a temporary worker? What is my status if I am re-employed by the hospital? Am I entitled to meals and uniforms? Can I live in? How many hours do I work? Do I use the time clock? When is pay day? What about overtime pay? What about absences? Am I entitled to leave of absence? Am I cared for when I am sick? What are my chances for getting ahead and how? What holidays do I help the hospital to celebrate? Am I going to get a vacation? What should I know about termination policies?

The employee is asked to read the booklet carefully and to report back to the personnel director at a designated time. A class is held each week, or as often as is necessary, at which time new employees may ask questions on the information contained in the booklet or on any other general procedures about which they may be puzzled.

When the new employee reaches the Dietary Department she is introduced to the supervisor to whom she is directly responsible. This may be a dietitian or one of our workers to whom we have delegated the responsibility of training new employees. These workers are called supervisors and, with one exception, are employees who have worked in the department for some time. We have four supervisors; one in the Main Kitchen, two in the Dishwashing Room, and our head waitress. Since we have

[1] Presented before the American Dietetic Association, Pittsburgh, October 20, 1943. Miss Robinson is chief dietitian, Christ Hospital, Cincinnati.

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a central dishwashing room, we have felt a great need for increased supervision there, so we now have supervisors on both the day and night shifts. The night supervisor is also able to handle emergencies in the Main Kitchen.

All of these supervisors, as well as our staff dietitians, were given the course in job instruction called "Training Within Industry" which is sponsored by the United States Government. We feel that this course has helped particularly in reminding our staff and supervisors that their method of teaching employees will make a great difference, in most cases, in the results obtained. It has made all of us realize how lax we have been in the past in many phases of our training program.

Typewritten copies of the duties involved in each job are given to the supervisor to pass on to new employees. Our job analyses are kept up to date by the student dietitians, each of whom is given a number of jobs to check. They either make the necessary changes on the old job analysis or construct a new one. Under present conditions these job specifications are constantly changing, since we no longer fit the person to the job but the job to the person.

In addition to the explanation of duties the supervisor sees that the employee has uniforms and the necessary equipment with which to work. She shows the employee where she is to work and introduces her to her co-workers.

We try to do as much "follow-up" as possible. This is tremendously important, but is made difficult by the time element. A supervisors' meeting is held weekly at which problems concerning employees are discussed. If a new employee is not doing well on the job assigned we transfer her to another if possible. Progress reports at the end of stated intervals are valuable in normal times.

No system, of course, can be perfect as long as there is an acute manpower shortage, but we have found that a division of responsibility among several well-chosen people lightens the burden for all.

MEDICAL DEPARTMENT DIETITIANS APPOINTED IN SEPTEMBER 1943

The list of September appointments includes information in the following order: the name; the college or institution from which academic degree was received; and the civilian or Army hospital at which training was received. Appointees for whom no training course is listed have been accepted on the basis of "qualified experience."

Arthur, Margaret Lipscombe: University of Tennessee.
Ball, Elgevia Alma: Howard University; Freedmen's Hospital.
Barnes, Ethel Lisenby: Alabama Polytechnic Institute.
Baron, Marie Eleanor: Illinois Institute of Technology; University of Chicago Clinics.
Bast, Esther Marie: University of Wisconsin; Ancker Hospital.
Bissell, Dorothy Jane: Bucknell University; Western Pennsylvania Hospital.
Brillhart, Ruth Margaret: Miami University; Edward J. Meyer Hospital, N.Y., and Walter Reed General Hospital.
Broach, Mary Arnold: University of Georgia.
Buchanan, Jean Louise: Kansas State College; Michael Reese Hospital.
Cables, Grace Marion Chessmore: University of Colorado; Ancker Hospital.
Connor, Mary Elizabeth Adams: Stout Institute; Cook County Hospital.
Cosner, Lillian Belle: Butler University; Indiana University Medical Center.
Cruzan, Clarah Catherine: Oklahoma A. & M. College; University of Iowa Hospitals.
Cubillas, Carlota Margarite: Florida State College for Women; Johns Hopkins Hospital.
Denio, Ethel Dorothy: Kansas State College: Mercy Hospital, Chicago, and O'Reilly General Hospital, Mo.
Durkes, Elizabeth Marion: University of Illinois; University of Michigan Hospital.
Ensign, Donna Marie: Michigan State College; Harper Hospital.
Gaetjens, Clara Louise: William & Mary College.
Goldstein, Beatrice Florence: New York University; New Jersey Cooperative Course.
Gonnella, Arline Ann: University of Minnesota; St. Anthony Hospital, Oklahoma.
Helgaas, Dorothy Annette: University of North Dakota; Cincinnati General Hospital.
Hill, Marion Louise: Cornell University.
Hobson, Edith Marie: Florida State College for Women; University Hospital, Cleveland.
Hollen, Evelyn: Iowa State College; University of Minnesota Hospitals.
Hughes, Bessie Vera: Piedmont College, Demorest, Georgia.
Johnson, Fuchsia Lucille: High Point College, N. C.; North Carolina Baptist Hospital.
Johnson, Grace Eleanor: University of California; Scripps Metabolic Clinic.
Johnston, Eleanor Irene: Carnegie Institute of Technology; Western Pennsylvania Hospital.
Kaufmann, Marthaross: Adelphi College, N. Y.
Kelly, Helen Margaret: Loretto Heights, Colo.; St. Louis University Hospital.
Kingrey, Clara Ella: Ohio State University.
Kossove, Harriet Rae: University of Minnesota; Jewish Hospital, N. Y.
Krause, Margaret Josephine: Colorado State College; Stanford University.
Lamb, Gertrude Evelyn: Colorado State College.
Latus, Celestine Mary: Cornell University.
Lewis, Pauline Elizabeth: University of Illinois; New York Hospital.
McCurdy, Ann Margaret: University of Texas; Grasslands Hospital.
McCurley, Lucy Ellen Morrow: Penn College, Iowa; Michael Reese Hospital.
McGinley, Ada Elizabeth: Montana State College.
McKray, Rosalind Irene Marion: Rhode Island State College; Walter Reed General Hospital.
McMurray, Ellen Marcella: Oklahoma College for Women; University of Oklahoma Hospital.
Mitchell, Barbara Souler: Rhode Island State College.
Moss, Frances Emma: Kansas State College; New Jersey Cooperative Course.
Nichols, Marion Elsie: Kansas State College.
Niemann, Doreen Ethel: Iowa State College; Scripps Metabolic Clinic.
Olson, Ann: University of North Dakota.
Olson, Ruth Marion: University of North Dakota; Vanderbilt University Hospital.
Parker, Sara Anne: Cornell University.
Pawlicki, Audre Elizabeth: University of Illinois; Cincinnati General Hospital.
Petley, Jean Eleanor: University of Akron; Beth Israel Hospital.
Pheasant, Josephine Doris: University of Wyoming; Seattle Course for Dietitians.
Pietrusz, Wanda Theresa: Mount Mary College, Milwaukee; Alameda County Hospital.
Roberts, Lou Sophia S.: University of Minnesota; Seattle Course for Dietitians.
Rowe, Phyllis Ruth: North Dakota State College; Montefiore Hospital.
Schemmel, Ruth Lillian: Clarke College; St. Mary's Hospital, Minnesota.
Shade, Genevieve Frances: University of Illinois; Cook County Hospital.
Sittel, Clementine: Oklahoma A. & M. College; Scripps Metabolic Clinic.
Sparkman, Margaret Katharyn: Florida State College for Women; Miami Valley Hospital.
Spehar, Anne Dorothy: University of Minnesota; University Hospital, Cleveland.
Tavis, Clara Bell: University of Colorado; Walter Reed General Hospital.
Thomas, Betty Korb: Hood College, Maryland.
Toreson, Ruth Jane: Washington State College; University of Maryland Hospital.
Tremback, Helen: Drexel Institute of Technology.
Tuomin, Dagmar Wilhelmina: Milwaukee-Downer College; Vanderbilt University Hospital.
Vines, Lois Kathryn: Ohio State University; Christ Hospital.
Warenmaa, Ann Elvira: Framingham State Teachers College; University of Minnesota Hospitals.
Waterman, Leah M.: University of Saskatchewan; Vancouver General Hospital.
Waugh, Vera Doris: University of Saskatchewan; St. Luke's Hospital, N. Y.
Webster, Emma Louise: State College of Washington.
Westerkamp, Ruth Ann: Miami University, Ohio; Cincinnati General Hospital.
White, Elizabeth Anne: Seton Hill College, Pa.; Starling-Loving University Hospital.

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"But darling, you'll put your foot in it!" giggled Elsie.

"THAT'S *just* what I intend to do!" jeered Elmer. "I'll put my foot right in that dietician's office and show *you* how to get this story across!"

"Well, just be sure you bring in the story about *special-purpose foods*," instructed Elsie. "Even the busiest dieticians usually take the time to hear about *them*."

"Who said *I'd* take much of their time?" grunted Elmer. "I'll just say HEMO is a swell special-purpose food—and forget the rest of your ravings."

"Why, Elmer," chided Elsie, "you mustn't forget that HEMO is a *vitamin*-fortified food that tastes *better* than the grandest-tasting chocolate malted!"

"Wait a minute!" snorted Elmer. "When it comes to handing out your line on vitamins, I *refuse!*"

"Now, dear," soothed Elsie, "the only thing you have to hand out is a jar of HEMO. And simply say that one glass of HEMO (2 teaspoonfuls mixed in milk) gives a person half his daily requirements of Iron, Calcium, Phosphorus and Vitamins A, B_1, B_2 (G), D, and Niacin!"

"And pretend I never *heard* of Vitamin C, I suppose!" sneered Elmer.

"You don't have to pretend with dieticians!" laughed Elsie. "They know that wartime conditions prevent us from getting Vitamin C for HEMO. After the war, HEMO will contain Vitamin C, too—but in the meantime, folks get it easily in tomato and fruit juices. All right, now—here she comes, and here's your chance—see that you start out on the *right* foot!"

Hemo compared with minimum daily adult requirements*

	Adult Minimum Daily Requirements*	1⅓ ounces of Hemo and 16 fluid ounces of milk (2 glasses)	1⅓ ounces (2 servings) of Hemo Powder
Vitamin A	4000 U.S.P. Units	4900	4000
Vitamin B_1	333 U.S.P. Units	400	333
Vitamin B_2	2 Milligrams	3	2
Vitamin C**	30 Milligrams**	Negligible**	None**
Vitamin D	400 U.S.P. Units	410	400
Niacin amide	***	10.3	10
Iron	10 Milligrams	15.7	14.7
Calcium	750 Milligrams	950	376
Phosphorus	750 Milligrams	750	288

*As set by Federal Security Administrator under authority of the Federal Food, Drug and Cosmetic Act.

**This product does not contain Vitamin C, an essential in food nutrition.

***Minimum adult daily requirements not yet fully established.

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Current Literature

Contributed by Helen Baughman, Janet Engebretsen and Hilda McEwen, Dietary Department, Johns Hopkins Hospital, Baltimore; Quindara Oliver Dodge, School of Home Economics, Simmons College, and Women's Educational and Industrial Union, Boston; and the Journal Staff.

AMERICAN JOURNAL OF DISEASES OF CHILDREN

Vol. 66, August 1943

*Intravenous hippuric acid test of hepatic function in infectious diseases of children. J. Meneghello and M. Drinberg.—p. 103.

Hepatic Function in Infectious Diseases of Children. Quick's modified technique of injection of sodium benzoate eliminated nausea and vomiting. Normal subjects were first tested to determine limits of normal hippuric acid synthesization. In patients with scarlet fever, diphtheria, tuberculous meningitis and lobar pneumonia the liver functioned abnormally in more than 80% of the cases. Hepatic function appeared normal in children with whooping cough, typhus and acute upper respiratory tract infections.

AMERICAN JOURNAL OF MEDICAL SCIENCES

Vol. 206, August 1943

*Diabetes and the weather. W. F. Peterson.—p. 197.

Diabetes and the Weather. Environmental situations aggravate the tendency of diabetics to succumb to coma. Joslin reports 3 cases in which diabetics died during rapid weather changes when the temperature fell and the barometric pressure rose. During cold weather peripheral blood beds tend to close, sugar is mobilized but unable to reach the periphery due to an accumulation of acid metabolites. After this phase potential or actual coma can develop when the vessels are more permeable and the tissues swell. Naunyn's study of sugar output in diabetics during cold seasons with varying environmental changes confirms the other studies. Intelligent diabetics can be instructed to modify insulin dosage as the weather changes, in addition to paying careful attention to clothing, exposure and indoor temperature.

AMERICAN JOURNAL OF PHYSIOLOGY

Vol. 139, August 1943

*The effect of experimental hepatitis on the plasma proteins of the immature rat. G. H. Berryman and J. L. Bollman.—p. 592.

*Influence of alimentation on the regeneration of plasma proteins following a single severe non-fatal hemorrhage. C. E. Lischer, R. Elman and H. W. Davey.—p. 638.

*The effect of choline and cystine on the serum phosphatase and hepatic dye clearance of dogs maintained on deficient diets. V. H. Hough, E. P. Monahan, T. W. Li and S. Freeman.—p. 642.

Blood Plasma Proteins and Hepatitis. Lowered level of plasma protein produced by carbon tetrachloride and restriction of diet is chiefly at the expense of plasma albumin. There was a voluntary restriction of food intake by treated animals but much greater restriction of the diet of untreated animals did not produce comparable lowering of plasma proteins. In treated animals the level of protein in the plasma was roughly proportional to dietary intake. The level of protein in the plasma, however, probably reflects the functional capacity of the liver more than the dietary intake. Substitution of protein (rated as good or poor for the production of plasma proteins in other experiments) for part of the dietary protein did not alter the levels of plasma protein in the treated animals.

Regeneration of Plasma Proteins After Hemorrhage. The presence or absence of exogenous sources of protein or carbohydrate alimentation does not influence the rapidity with which the body compensates for the acute plasma protein loss during the first 72 hours following a single severe nonfatal hemorrhage.

Protein-Deficient Diet and Decreased Hepatic Function. The decrease in dye clearance and the elevation of serum phosphatase caused by a protein-deficient diet are largely prevented in adult dogs for 6 to 8 weeks by the daily ingestion of 0.5 gm. choline chloride. The effectiveness of choline was demonstrable only during the early weeks of the protein deficiency. Changes in dye clearance and serum phosphatase caused by the protein-deficient diet are increased by the daily ingestion of 1 gm. cystine. Choline-deficient puppies maintained on a diet low in methionine rapidly develop a marked increase in serum phosphatase and a decrease in dye clearance. Oral choline supplements will prevent or reverse these manifestations of impaired liver function.

AMERICAN JOURNAL OF PUBLIC HEALTH AND THE NATION'S HEALTH

Vol. 32, August 1943

*The U. S. Public Health Service restaurant sanitation program. A. W. Fuchs.—p. 848.

Restaurant Sanitation. The U. S. Public Health Service urges states not already doing so to launch a restaurant sanitation program along the same lines as the milk control program. There is every indication that greater attention to restaurant sanitation is warranted particularly in defense areas. A brief outline of the provisions of the recommended restaurant ordinance is given.

ARCHIVES OF INTERNAL MEDICINE

Vol. 72, August 1943

*Involvement of the liver in disease of the gallbladder. J. L. Balty and S. Gray.—p. 176.

*Estrogen, diabetes and the menopause. S. Gitlow and D. M. Kurschner.—p.250.

Liver and Gallbladder Disease. The colloidal gold test of the serum in hepatic disease was used on 100 patients with proved disease of the gallbladder. Positive tests were found in 46 patients: 55% of jaundiced cases, 58.8% in patients having jaundice plus infection, and 53.3% of patients having acute cholecystitis. Hepatic damage was indicated as long as infection of gallbladder persisted; 100% of patients having jaundice and infection for 2 months or over showed positive colloidal gold tests. Repeated insults to the liver increased damage to the organ, indicating the value of surgical attention early in gallbladder infections.

Diabetes and Menopause. The menopause is associated with hyperactivity of the anterior lobe of the pituitary gland, and the "diabetogenic" factor may be increased. Tuttle observed that 38 of 72 diabetic women had the onset of diabetes at the menopause. As estrogen inhibits the pituitary gland, this hormone has been used to treat diabetes without the aid of insulin. Patients so treated must be carefully selected and skilfully handled by competent physicians, and as yet no criteria are available.

ARCHIVES OF PEDIATRICS

Vol. 60, August 1943

*Epilepsy—A clinical and therapeutic review. H. R. Litchfield.—p. 426.

Epilepsy. The ketogenic diet has proved of benefit for certain patients. Dehydration is also mentioned as a method of altering seizure threshold.

BRITISH MEDICAL JOURNAL

No. 4304, July 3, 1943

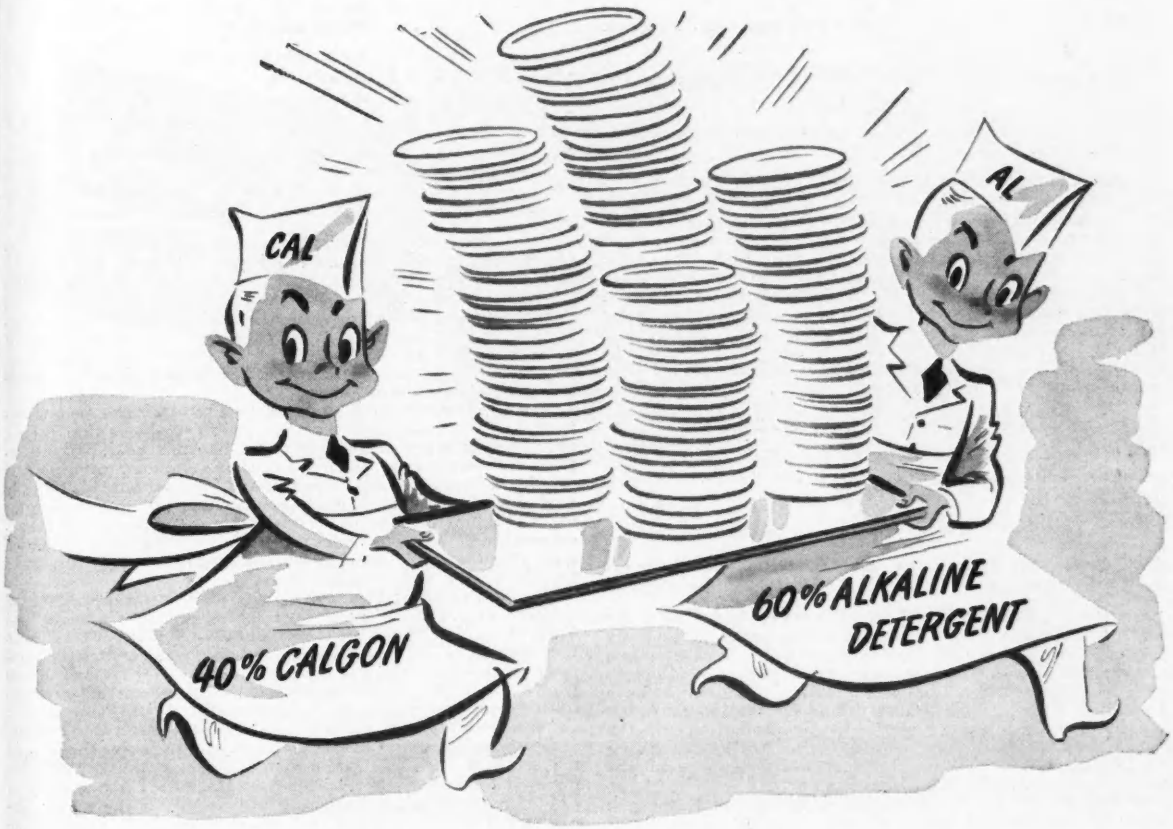
*The food situation in Europe. Editorial.—p. 16.
Gastric factor in pellagra. Editorial.—p. 18.

No. 4305, July 10, 1943

*The availability of the calcium of milk. K. Coward, E. Kassner and L. Waller.—p. 39.

European Food Situation. In *Starvation in Europe*, Geoffrey H. Bourne concludes that few countries in Europe had a sufficiently high standard of nutrition before the war. With the possible exception of Denmark, Great Britain is better fed than any other country. In Greece, Croatia, and parts of Poland and European Russia, both urban and rural populations are suffering from severe starvation. In Serbia, Belgium, and incorporated Poland there is sufficient food but the peasants are better off than the urban populations. In France and many parts of Norway the peasant populations have retained their prewar consumption of food but the urban populations suffer from serious deficiency. Germany is only a little worse off than Denmark but Italy is in but little better plight than Belgium. The people of Great Britain are reminded that when hostilities cease they may be called upon to continue rationing until the pangs of hunger are stilled in Europe.

Availability of Calcium. The calcium of milk is no more readily available for calcification in the growing rat than is that contained



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WATER hardness is the major barrier to good dishwashing. It is responsible for the milky film on glassware, the streaks on china, scum and sludge in the water and scale in the machine.

Most compounds soften water to some extent by precipitating the minerals as a sludge in the bottom of the machine. Calgon* is the one product that softens water 100% *without forming a precipitate*. That is Calgonite's exclusive No. 1 action —the reason why Calgonized dishes sparkle without a trace of film—why the machine literally washes itself.

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BULLETIN OF THE JOHNS HOPKINS HOSPITAL

Vol. 73, August 1943

*Vitamin A levels in maternal and fetal blood plasma. J. N. Byrn and N. J. Eastman.—p. 132.

Vitamin A in Maternal and Fetal Blood. Vitamin A levels were determined in 297 women at term and in 14 during pregnancy; in 50 cases the vitamin A level of the fetal cord blood was also obtained. Average for pregnant women was below that of normal levels, and had no correlation between women who were in lower income groups. Lower vitamin A levels may be due to increased nutritional demands or as a result of blood dilution at term. Vitamin A levels in the fetal cord were lower than in maternal blood; only traces of carotene could be found in the fetal blood. Large doses of vitamin A and carotene given before and during labor failed to increase fetal blood levels, although the maternal level rose. Placental transfer of vitamin A is still unclear.

CANADIAN JOURNAL OF PUBLIC HEALTH

Vol. 34, May 1943

*A nutrition survey in East York township. E. Riggs, H. Perry, J. Patterson, J. Lieson, W. Mosley and E. W. McHenry.—p. 193.

Bacterial food poisoning. C. E. Dolman.—p. 205.

Vol. 34, August 1943

*Errors in the calculation of the nutritive value of food intake. C. M. Young and E. W. McHenry.—p. 367.

Nutrition Survey. Study of food intake assessed for adequacy in terms of recognized standards, showed widespread insufficiency of thiamin and ascorbic acid, moderate occurrence of calcium and riboflavin deficiencies. Diets were reasonably good in other respects. On the basis of a "diet score" 72% of the girls and boys had excellent or good food intakes. Some correlation exists between the average adequacy of the food consumption and the general level of health but there are many discrepancies. There was no correlation between calcium intake and dental condition and no evidence of thiamin and ascorbic acid deficiencies. Various conclusions may be drawn: (1) the dietary records do not give a reliable assessment of nutritional conditions; (2) the standards in current use are too high in several respects; or (3) the methods of appraisal used in this study were not sufficiently sensitive. Apparently the assessment of nutritional status in a large group at present is difficult if not impossible in the absence of definite clinical signs of deficiencies.

Errors in Calculation of Iron. Calculation of iron intake for a few meals might be quite erroneous but, if based on a sufficiently large number of meals, would agree with actual values closely enough for practical purposes in dietary surveys.

CANADIAN MEDICAL ASSOCIATION JOURNAL

Vol. 48, June 1943

*The diabetic. E. P. Joslin.—p. 488.

Vol. 49, July 1943

*The effect of riboflavin on corneal vascularization and symptoms of eye fatigue in RCAF personnel. F. F. Tisdall, J. F. McCreary and H. Pearce.—p. 5.

Anorexia. G. E. Swallow.—p. 43.

*Overnutrition. F. G. Pedley.—p. 52.

The Diabetic. The treatment of diabetics before the insulin era is contrasted with that today. The average carbohydrate intake at all ages is 156 gm. The stress on individual responsibility in the diabetic has been and remains the keynote of treatment. Joslin disapproves the idea of the diabetic seeking privileges in the rationing of oil, gas, or even food in addition to his release from war services. He suggests the use of fish, non-rationed cheese, nuts, eggs, glandular organs and poultry to make up any deficiency in the meat allowance.

Riboflavin. The incidence of vascularization of the cornea among apparently healthy young adults in Canada is surprisingly high and seems to vary with the riboflavin-containing foods in the diet. When riboflavin in large dosage was given for a period of 2 months, decreased vascularization of the cornea resulted in a large percentage of cases and caused marked relief of eye fatigue in men exposed to glare while flying.

Overnutrition. Because of the influence of obesity on mortality rates and its connection with hypertension and cardiac disease, the control of weight under modern conditions is obviously a concern of nutritionists and should be linked with nutrition programs, otherwise such programs may actually result in promotion rather than reduction of obesity. The prevention of obesity is a problem of education; its cure, a difficult problem of therapy. Hospitalization is probably indicated in the majority of overweights.

FOOD RESEARCH

Vol. 8, July–August 1943

*Bacteriology of ice. L. B. Jensen.—p. 265.

*Protein-ascorbic acid complex in carrots. F. DeEds.—p. 275.

*Carotene in content of fresh and frozen green vegetables. F. P. Zscheile, B. W. Beadle and H. R. Kraybill.—p. 299.

*Synthesis of vitamins by microorganisms in relation to vitamin content of fancy cheeses. P. R. Burkholder, J. Collier and D. Moyer.—p. 314.

*Effect of method of thawing upon losses, shear, and press fluid of frozen beefsteaks and pork roasts. G. E. Vail, M. Jeffery, H. Forney and C. Wiley.—p. 337.

Bacteriology of Ice. The harvesting of ice must follow "instructions" based upon bacteriological criteria. After ice is stored for several months the nonsporing bacteria are greatly reduced in number. The consensus among sanitarians is that ice is not an important factor in the spread of typhoid fever. Bacteria in ice are destroyed more rapidly at the temperatures of natural ice, 0 to −5°C. (32 to 23°F.). At lower temperatures down to that of liquid air, bacteria like the typhoid bacillus remain viable for 19 months or longer.

Protein-Ascorbic Acid Complex in Carrots. The results obtained with carrots agree with the claims of others that certain vegetables contain protein-combined ascorbic acid. Investigations on the general occurrence of such combined ascorbic acid should be extended. Since ascorbic acid in this form is biologically available, it must be taken into consideration in determining the value of different foods and in comparing the bioassay and chemical methods. The degree of protection which such a combination may afford ascorbic acid during dehydration and processing of food is worthy of investigation.

Carotene in Vegetables. In a study of the carotene content of spinach, asparagus, broccoli, beet leaves, peas, green beans, and Lima beans, analyses made spectrophotometrically for total carotene as well as for beta-carotene and neo-beta-carotene in vegetables at different stages of development and after various periods (up to two years) of low-temperature cold storage after quick-freezing, the varietal differences were small. During storage both the total carotene and the percentage of beta-carotene decrease.

Vitamins in Fancy Cheeses. Thiamin, riboflavin, biotin, and nicotinic acid, as determined microbiologically, appeared to increase in the surface layers of Camembert, Brie, Liederkranz, and Limburger cheeses through progressive stages of ripening. The evidence strongly suggests that vitamins of the B complex are synthesized by micro-organisms and stored in the outer portions of certain fancy cheeses during the curing period.

Effect of Method of Thawing Upon Frozen Beefsteaks and Pork Roasts. Thirty-three paired beefsteaks and 48 paired pork roasts were studied to determine the effect of thawing at room temperature, at refrigeration temperature, and at oven temperature upon the shear, press fluid, and percentage losses of the cooked meat. The results indicate that thawing beefsteaks and pork roasts at room temperature, at refrigerator temperature, and in the oven gave similar results. However, both steaks and roasts thawed at oven temperature were slightly less tender and required a longer cooking time than those thawed by the other two methods. Steaks and roasts thawed at room temperature yielded the least press fluid and the roasts thawed at room temperature had the highest percentage of total loss.

JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Vol. 123, September 4, 1943

*Metabolic studies of patients with cancer of the gastrointestinal tract: XVI. The treatment of hypochloremia refractory to the administration of sodium chloride, especially in patients with gastrointestinal cancer. I. Ariel, J. C. Abels, G. T. Pack and C. P. Rhoads.—p. 28.

*Rh antibody in breast milk. Current comment.—p. 38

Vol. 123, September 18, 1943

*Avitaminosis by interference. Editorial.—p. 151.

Vol. 123, September 25, 1943

*Causes of rejection and the incidence of defects among 18 and 19 year old selective service registrants. L. G. Rowntree, J. H. McGill and T. I. Edwards.—p. 181.

*Individual susceptibility to dental caries. Current comment.—p. 213.

Vol. 123, October 2, 1943

*Handbook of nutrition: XXIV. Nutrition in preventive medicine. W. H. Sebrell.—p. 280.

*The use of vitamin D in the treatment of refractory rickets. Council on Pharmacy and Chemistry.—p. 287.

Metabolism. Five patients had hypochloremia postoperatively which was resistant to the administration of large amounts of saline solution and associated with hypoproteinemia. In those instances in which the level of serum protein was increased therapeutically, the disturbed electrolyte equilibrium was corrected. The existence of hypoproteinemia may seriously prevent the correction of the chloride imbalance by the administration of saline

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solution alone. Alkalosis was regularly associated with the syndrome and may have contributed to its severity.

Rh Antibody in Breast Milk. The possibility that Rh antibody is given off in breast milk in sufficiently high titer to cause additional blood destruction in Rh positive infants is suggested by recent data. Assuming that ingested Rh antibodies pass unaltered through the intestinal mucosa to enter the circulation, the colostrum and early breast milk of an Rh negative mother who had given birth to an erythroblastotic child might be a contributory factor in further blood destruction in the Rh positive infant.

Avitaminosis. Vitamin deficiency may occur in man or animals despite the presence in the diet of a normally adequate amount of the appropriate vitamin. Perhaps the most widely known example of this is the occurrence of a vitamin K deficiency—characterized by a low prothrombin level in the blood and a consequent tendency to hemorrhage—in man or animals when bile salts are prevented from reaching the intestine. Whether present in the diet or synthesized by intestinal micro-organisms, fat-soluble vitamin K is of little value to the body in the absence of these salts, which are necessary for its proper absorption. Other examples of such "secondary vitamin deficiencies" include avitaminoses observed in animals fed a diet containing a constituent which destroys or makes unavailable a particular essential food factor. Biotin deficiency can be experimentally produced in human subjects by incorporating large amounts of dehydrated egg white (200 gm. a day) in the diet for several weeks. The story of Chastek paralysis in silver foxes discloses an extremely interesting example of avitaminosis by interference. When the meat in the diet of foxes being raised for their fur was replaced, for economic considerations, with 10% or more of raw fish, hundreds of animals became ill for no apparent reason and died. Still other examples of avitaminoses resulting from interference with an essential food factor are less well characterized. In all cases the diets of the animals were unusual, containing comparatively large amounts of uncooked egg white, raw fish or, in some instances, drugs, and would not be normally considered as human food by persons in this country.

Physical Defects of Registrants. Dental defects were numerous, particularly in white registrants, but they were unimportant as cause of rejection during this time period. The 10 leading causes of rejection among white 18 and 19-year-old Selective Service registrants were, in decreasing order of occurrence, eye defects, mental disease, musculoskeletal defects, cardiovascular defects, ear defects, hernia, neurologic defects, educational deficiency, underweight and mental deficiency. For 18 and 19-year-old Negroes the 10 leading causes of rejection were educational deficiency, syphilis, cardiovascular defects, mental disease, musculoskeletal defects, hernia, eye defects, neurologic defects, mental deficiency and tuberculosis. Half of the rejections of Negro youths resulted from educational deficiency or from syphilis. These data are based on local board and induction station examinations, made during December 1942 and January and February 1943. In the following broad groups of defects, white youths had higher rejection rates than Negroes: eyes, ears, nose, kidneys, nervous system, feet, endocrines, overweight and underweight. In the following broad groups of defects, Negro youths had higher rejection rates than white youths: tuberculosis, cardiovascular disease, hernia, genital disease, syphilis, gonorrhea, skin disease, educational deficiency, mental deficiency and mental disease. Underweight and overweight were more common among white than Negro youths. No data were recorded on the examination form to show how frequently this or any other defect could be presumed to be the result of malnutrition. Entries on the physical examination form were usually restricted to objective findings with only infrequent references to history or to the cause of the condition under discussion.

Dental Caries. The causes of dental caries remain obscure. In a recent study it is concluded that the food impaction theory fails to explain individual susceptibility to caries and the mechanism by which the various types of decalcification of the enamel are produced. Chemical changes in the saliva following changes in diet seem to offer a more likely explanation.

Nutrition in Preventive Medicine. Sebrell reports the incidence of nutritional anemia and vitamin A deficiency in recent years in this country and abroad and cites the deficiency symptoms in each instance. Vitamin D deficiency incidence likewise is cited as indicated by occurrence of rickets. Other deficiency states—osteomalacia, "war osteopathy" or "hunger osteomalacia," and tetany are briefly discussed in a chapter to be completed in a subsequent issue of the *Journal* of the American Medical Association.

Vitamin D in Rickets. The Council on Pharmacy and Chemistry of the American Medical Association has given consideration to the use of relatively massive doses of vitamin D in the treatment of refractory rickets and has accepted at least one preparation designed for such use. "If representations are made for use of massive doses of vitamin D in the treatment of refractory rickets they must be accompanied by adequate precautions with respect to the danger of toxic effects and how they can be avoided."

JOURNAL OF BIOLOGICAL CHEMISTRY

Vol. 149, August 1943

*Stability of thiamine to heat. II. Effect of meat-curing ingredients in aqueous solutions and in meat. D. A. Greenwood, B. W. Beadle and H. R. Kraybill.—p. 349.
*The composition of sweat, with special reference to the vitamins. O. Mickelsen and A. Keys.—p. 479.

Stability of Thiamin to Heat. The destruction of thiamin upon heating is a function of the temperature, time of heating, the p_H of the medium, and the nature of the other substances present. Thiamin is less stable to heat in aqueous solution than in lean pork muscle.

Vitamins in Sweat. Under conditions of continued profuse sweating, losses of ascorbic acid, thiamin, and riboflavin are negligible from the standpoint of vitamin nutrition. The sweat loss of nicotinic acid under these conditions could be significant, however.

JOURNAL OF PEDIATRICS

Vol. 21, August 1943

*Gastrointestinal allergy and the celiac syndrome. R. H. Kunstadter.—p. 193.
*The nutritional care of children in wartime. J. D. Boyd.—p. 252.

Gastro-intestinal Allergy and Celiac Syndrome. It is suggested that food allergy be considered as a possible cause for celiac syndrome. Evidence is presented that cow's milk was the principal offending food in 3 cases.

Nutritional Care of Children in Wartime. Dietary supervision can lead to improved health and vigor in children who at first do not appear grossly ill or malnourished. With an intake designed to meet all nutritional needs in an optimum manner, the incidence of tooth decay in such children over periods of several years has been negligible. All requisites for good nutrition can be supplied through use of easily available foods, if fish liver oil is included among the foods. If recommendations of the National Research Council are valid, the majority of children in this country are subsisting on inadequate diets.

SCIENCE

Vol. 98, August 6, 1943

*Vitamin C in evergreen-tree needles. M. Donnelly.—p. 132.
*The comparative nutritive value of butter and some vegetable fats. H. J. Deuel, Jr., E. Movitt and L. F. Hallman.—p. 140.

Vol. 98, August 27, 1943

*Vitamins in edible soybeans. P. R. Burkholder.—p. 188.
*Food dehydration. Science News.—p. 10.

Vitamin C in Evergreen-Tree Needles. Needles of ordinary pine trees contain large quantities of vitamin C. Biochemists in Moscow and Leningrad have organized mass production of vitamin C concentrates from pine needles. Despite the fact that the percentage of the vitamin in such needles is small, this source of vitamin C is of particular value on account of the huge pine forests in Russia.

Comparative Nutritive Value of Butter and Some Vegetable Fats. On an adequate vitamin intake the fats studied, which included corn, cottonseed, olive, peanut and soybean oils as well as butter and vegetable margarines, were of equal nutritional value for growing rats. Diets containing all these fats were used with equal efficiency in transformation to body tissue.

Vitamins in Edible Soybeans. Soybeans possess desirable qualities not alone by their contribution of essential amino acids but also through their stores of fatty materials and vitamins. Both immature and mature beans of all varieties contain appreciable stores of B vitamins. With maturation there is an increase in thiamin and pyridoxine and a decrease in nicotinic acid. The vitamin values of soybean compare favorably with wheat and with meats except that riboflavin and nicotinic acid in the beans are lower than in meat.

Food Dehydration. Better food dehydration through use of radio-frequency energy to drive out the moisture has been developed. Evidence indicates that vegetables dehydrated by the electronic method will not deteriorate over a period of 1 to 2 years even in hot, humid climates. As a first step, 80% of the water content of vegetables is removed by conventional dehydration. The vegetables are then compressed into blocks from which the remaining moisture is reduced to 1% by radio-frequency energy in partial vacuum. Drying is accomplished in about one hour. Due to the speed of the process the vitamin content of the dried foods is reported to be unusually high. The cost compares favorably with other methods of dehydration.

SOUTHERN MEDICAL JOURNAL

Vol. 36, August 1943

*Milk intolerance. The cause of a nutritional entity: A clinical study. P. A. McLendon and D. S. Jarger.—p. 571.
*Liver and burns. Editorial.—p. 599.

The man with the flexible feet

Ready to step into *your* shoes and look at the dishwashing problems in your restaurant from the same angle *you* do.

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Milk Intolerance. A series of 65 cases of children is reported showing that milk intolerance caused such symptoms as constipation, anorexia, abdominal pains and distension, pallor, lassitude, irritability, recurrent diarrhea, repeated colds and urinary symptoms. These symptoms, which had not responded to the usual treatment, did improve or disappear when milk was omitted from the diet. Calcium, iron and extra vitamins had to be given to supplement the diet.

Liver and Burns. Experimental work with animals in the treatment of shock and extensive burns has shown the mortality rate reduced by the use of crude liver extracts. Apparently the anti-shock principle is not identical with the antianemic principle. Choline, adrenal cortical hormones, thiamin, pantothenic acid, nicotinamide and riboflavin given in large doses had no anti-shock activity.

BAKER'S HELPER

Vol. 80, July 17, 1943

Will use of enriched flour be compulsory for all bakery products?—p. 27.
*Bakers on guard to avert wheat waste. L. Sullivan.—p. 30.
*Compulsory enrichment of white flour. J. Burns.—p. 34.

Vol. 80, August 14, 1943

*FSA's proposed standards for bread and rolls.—p. 32.
Planned economies reduce operating costs. R. Miller.—p. 34.

Wheat Conservation. The baking industry is mobilizing a wheat conservation drive to check waste. The world wheat supply is 10 to 15% lower than in 1942.

Compulsory Flour Enrichment. Any standard for enrichment should be made to apply to the finished product. There are numerous grades of white flour milled which vary widely in natural vitamin content. If these flours are to be enriched to a certain level, each of the grades would have to have different amounts of vitamins added. Flour would have to be enriched to varying levels, so that the baker could choose that level of enrichment which would adequately supplement the vitamins supplied from milk, etc. Not all mills are equipped to produce enriched flour. A large variety of products do not lend themselves to enrichment.

FSA's Proposed Standards. The Federal Security Agency has issued regulations giving proposed definitions and labelling requirements for various types of commercial bread. (*See Baker's Helper* for August 14.)

FOOD INDUSTRIES

Vol. 15, August 1943

*What Hot Springs conference means to food processors. P. H. Appleby.—p. 59.
Two methods for dehydrating citrus juices. R. Holzcker.—p. 62.
How to compress foods.—p. 64.
This is what it costs to dehydrate vegetables. Part II. W. D. Ramage and C. L. Rasmussen.—p. 66.
Flowsheets for production of salted peanuts and peanut butter.—p. 70.
*Manual of dairy detergents and cleaning practices. Part II. M. E. Parker.—p. 71.
*How distribution of vitamins in wheat affects flour. J. S. Andrews.—p. 78.
*U. S. production of oil of sage. E. S. Guenther.—p. 80.
*War boosts production of domestic paprika. J. H. Collins.—p. 83.
*Paper is scarce—conserve it.—p. 84.
*Soya scores two hits.—p. 86.
Chocolate peanut butter.—p. 86.
*Breakfast food or dessert.—p. 86.
*Cream stiffener.—p. 86.
*Dehydrated mushrooms.—p. 89.
*FSA states government's policy on enrichment.—p. 91.
*Dehydration in natural gas saves vitamin C.—p. 92.
*Congress takes action against grade labels.—p. 93.
*Protein is produced as alcohol byproduct.—p. 93.
Macaroni plays wartime role.—p. 95.
Molasses shortage threatens acids, yeast.—p. 98.
Additional fats made available to users.—p. 99.
*Laboratory detergent.—p. 111.
*Tubing for food plants.—p. 111.
Carotene fortification.—p. 125.
Fruit juice blends.—p. 125.
*Cooked flavor.—p. 126.
Dried whole egg powder.—p. 127.
*Loss of coffee aroma.—p. 128.

Food Conference. The United Nations Conference on Food and Agriculture started its discussion of food on this basic fact: Despite the industrial revolution, two-thirds of the people of the world are normally engaged in producing food, yet two-thirds of the people do not have enough to eat. We now know what foods are necessary to proper nutrition and how fundamentally important is proper nutrition; we also know how to produce enough to look confidently toward the day when everyone can be well fed. The conference therefore proclaimed that the world can, should, and must be adequately fed, that world-wide industrial expansion is necessary for its own sake and to back up expanded farm production with adequate purchasing power, and to provide opportunities for people now crowded too closely on the land to make a decent livelihood. This will demand orderly and friendly international trade between nations. In general this sound and reasonable program set up by the conference is a freedom-from-want program for the world.

Dairy Detergents. Synthetic organic detergents are known as surface active or wetting agents with properties of wetting-out, dispersing, emulsifying, penetrating or cleaning or any combination of these properties. By lowering surface tension, the wetting agent penetrates the interface between the surface and the dirt upon it, breaking the bond between the dirt and the material to which it adheres. Rinsing operation carries the dirt away. Soap powders have a high cleaning value but are not advisable in dairy cleaning because they leave a film on the surface that holds dirt. A wetting agent for dairy equipment cleaning must lower surface tension and have detergent or cleaning properties as well. Such detergents are also much more readily rinsed away. Desirable cleaners include Mikro-San, Mikro-Stat, Wyandotte S.R.-5, and Mangus 66 which are acid cleaners (with wetting agents); Wyandotte GLX, Solvay Cleanser 600, Wyandotte Keego Cleaner, Solvay Cleanser No. 800, B-K General Cleanser, Metso 22, Metso 66, Mangus IDX, Rex No. 372-2 Dairy Cleanser which are alkaline cleaners (with wetting agents). The three major polyphosphates now being used largely as water conditioners in dairy detergency, which have limited use as dairy cleaners in some instances, are metaphosphate, tetraphosphate, and pyrophosphate. Sodium metaphosphate with properly chosen alkalies has excellent detergent properties and prevents tendency of alkaline cleaners to form waterstone-milkstone deposits but must be used carefully in hot solutions. Sodium tetraphosphate is the most effective all-round polyphosphate for preventing the precipitation of both calcium and magnesium salts and its stability under the adverse conditions of heat and contamination by milk solids is advantageous. It is also effective in reducing corrosion. An example is Quadrafos. Tetrasodium pyrophosphate does not compare with the above in water-softening properties but is less expensive per pound. It tends to eliminate water spotting by holding the water hardness in solution until carried off by rinsing. Examples are Diamond All Purpose Cleanser W, Rex No. 372-2 Dairy Cleanser, Magnus IDX, Nafos Briquets, Wyandotte GLX, Wyandotte C.W., Solvay Cleanser 600, B-K General Cleanser. Abrasive cleaning compounds such as volcanic ash or pumicite, either alone or in combination with cleaning compounds, feldspar and silica flour, are very effective but should be used with care to avoid scratching surfaces. Scouring powders compounded with wetting agents are superior to those containing soap because rinsing of fine abrasive particles is much easier. Mechanical abrasives, such as steel or copper wool, are not recommended for cleaning dairy equipment, especially tinned surfaces.

Vitamins in Wheat. The nutritional value of different types of flour is influenced by uneven distribution of vitamins in the wheat kernel. Thiamin concentration has been found to be 50% richer elsewhere than in the wheat germ, usually considered the focus of thiamin concentration. Niacin is now believed to be concentrated mainly in the bran; riboflavin in the wheat germ. Very little is known as to the distribution in wheat of other factors such as pantothenic acid, pyridoxine and biotin. The highest concentrations of pantothenic acid occur in feeds, especially bran. The germ is nearly nine times as concentrated in thiamin as is the rest of the wheat kernel. The niacin content appears to increase uniformly from the inner endosperm to the outer bran. The thiamin content tends to be lowest in the soft wheats and highest in spring wheats, but the same wheats grown in separate localities show large differences in thiamin content. Differences also occur from one crop year to the next. From a practical standpoint these variances are not of major concern since they are minimized by the blending process of flours. A survey of whole wheat flours obtained from scattered sections of the country showed an average thiamin content value of 2.25 mg. per pound with normal variations of less than 15%. In contrast to thiamin, riboflavin is present in surprisingly constant amounts in all types and varieties of flours and from various sources. Niacin variations are between those of thiamin and riboflavin, the average being approximately 27 mg. per pound.

Sage. With the cut in imports of sage from the Mediterranean area, it has been produced in appreciable amounts domestically. Climatic conditions, methods of harvesting, soil conditions, and the different varieties of the plant make it difficult to obtain a product with an odor and flavor identical to that of the imported. Dried leaves or the volatile oil obtained by steam distilling of the leaf are used.

Paprika. During the period of limited importation of paprika

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Libby's zestful Tomato Juice adds needed flavor to many wartime dishes. The three shown here can all be made from **one 18-oz. can.**

SPANISH RICE

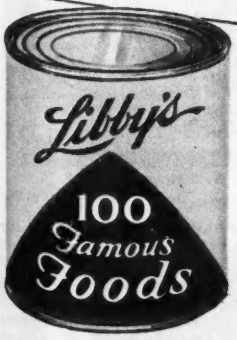
Cut 3 slices bacon into small pieces. Add 2 tbsp. minced onion and 2 tbsp. minced green pepper and fry until brown. Add 2 cups cooked rice, ¾ cup Libby's Tomato Juice, 1½ tsp. salt, and ⅛ tsp. pepper. Simmer 10 to 15 minutes or until most of the liquid has been absorbed by the rice. (Serves 4)

SAVORY SAUCE

Melt 2 tbsp. butter. Add ¼ cup minced onion and cook until golden brown. Remove onion, add 2 tbsp. flour and brown slightly. Gradually add 1 cup Libby's Tomato Juice and ½ cup water. Heat to boiling, stirring constantly. Boil 3 minutes. Season with 1 tsp. salt, ⅛ tsp. celery seed and ⅛ tsp. pepper. Serve hot over meat or fish. (Serves 4 to 6)

MOLDED MAIN DISH SALAD

To 1 cup Libby's Salmon or leftover cooked meat, poultry, or fish, add 1 chopped hard cooked egg, ¼ cup chopped celery, ½ tbsp. minced onion, ½ tsp. salt, and ⅛ tsp. pepper. Soften 1½ tsp. unflavored gelatin in ¼ cup cold water for 5 minutes. Dissolve over hot water and add to ½ cup Libby's Tomato Juice. Fold in mixture. Turn into 4 (3½ inch) ring molds which have been rinsed with cold water and chill until firm. Serve on greens with mayonnaise. (Serves 4)



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pepper seed, domestic production has received considerable impetus. Color, blandness and fineness are the points on which quality is judged. More than half the California output goes to food processors who use the product chiefly as coloring in chili con carne, catsup, sausage, and meat loaf. It is packaged principally in 220-lb. barrels and in 1 and 5-lb. packages.

Paper Conservation. Paper, a strategic material which may be expected to become increasingly scarce, has been put to use in conserving metals, glass, and rubber. Review your paper usage by asking: is it necessary, can lighter paper be used, can a smaller size be used, can the number of printed pieces be reduced, and is an excessive inventory on hand?

Soya Products. Two new soya products, "Stoy" which is a high-protein flour, and "Soya Spread," a protein sandwich filling, are now on the market.

Dried Apples. "Apella Crisps," made from dried apples, may be used as a breakfast food, as apple sauce, in puddings, cakes or other desserts. A 4½-oz. can is equivalent to 16 average-size apples. The product must be kept tightly covered in the container to retain crispness.

Cream Stiffener. Consumer-size bottles of "Au Gourmet Whip'O," an aid to whipping thin cream, are on the market. This product contains sugar, water, lime, and Epsom salts.

Dehydrated Mushrooms. "Sunred" dehydrated mushrooms are on the market in consumer-size glassine envelopes. Soaked in boiling water for 30 minutes before using, the entire mushroom is usable.

Enrichment Policy. The Federal Security Agency has promulgated a "statement of policy with respect to foods" intended to guide any food manufacturer who wishes to add vitamins, minerals or other special nutritive ingredients to his products.

Dehydration With Natural Gas. Foods dehydrated in an atmosphere of natural gas (methane or ethane) retain nearly all of their original vitamin C content without adverse effect on color or flavor. Vitamin C losses in foods dehydrated in air vary from 50 to nearly 100%. The natural gas process of dehydration is claimed to lengthen the storage life of the food as well. Dehydraters can be designed for a natural gas atmosphere so that the gas is recycled, fresh gas being added only to the extent necessary to prevent undesirable accumulation of oxygen.

Grade Labels. Prior to its recess on July 8, Congress prohibited by legislation mandatory grade labeling or the required use of standards and specification in the sale of commodities and required invoice statements of standards. An exception to this is where the standards in question were previously in general use in the industry, or previously lawfully required by statute or by regulation of government agency other than OPA.

Protein as Alcohol By-product. Concentrated protein, produced as a by-product of a new process for making alcohol developed at the Park and Tilford distillery, has the appearance and consistency and food value of dehydrated egg whites. This product is expected to be produced at a rate of one billion pounds a year and will sell for as little as 5 cents per pound.

Laboratory Detergent. "Alconol" is a new detergent particularly suitable for use in laboratories because of its wetting agent properties, low surface tension action and cleansing properties without leaving any film.

Plastic Tubing. Plastic tubing with the flexibility of rubber is available for a wide range of purposes for which rubber tubing is prohibited. It will resist extremes of temperatures and pressure of 40 lb. when unbraided. The size range is the same as that of prewar rubber tubing.

Milk. Homogenization before pasteurization reduces the likelihood of cooked flavor in milk commercially pasteurized by the holder method at temperatures up to 150°F.

Coffee Aroma. Staling of coffee appears to be due to volatile compounds or compounds formed in the vapor phase. For the storage intervals involved in ordinary trade channels, the initial partial pressure of oxygen must be reduced substantially below a 29″ initial vacuum to prevent the onset of a detectable stale flavor before the coffee reaches the customer.

HOSPITAL MANAGEMENT

Vol. 56, July 1943

*Estimate 25 per cent saving in food costs with hospital canning program.—p. 79.
Madison hospital dietitians aid rationing board in diet problems. C. E. Pearson.—p. 85.
The retention of vitamins in meat during the cooking process. C. A. Elvehjem.—p. 87.

Hospital Canning Program. Salem (Mass.) Hospital (chief dietitian, Edith L. Hoadley) is employing an old idea on a new scale. With the cooperation of 600 women of the community, this hospital will be provided with 20,000 quarts of canned fruits and vegetables this season, thereby cutting food cost by 25% and effecting a distinct saving in ration points. As added protection against food shortages the hospital has rented a "root cellar and squash house" where tons of fresh vegetables will be stored for winter use.

HOTEL MANAGEMENT

Vol. 44, July 1943

*Are hotels necessary to the war effort?—p. 17.
How to prepare chicken for frying and sautéing.—p. 49.
*Finding desirable waitresses. W. Brodie.—p. 57.
*How to tenderloin a trout. J. H. Breland.—p. 58.

Vol. 44, August 1943

*The essentials in planning a kitchen of any size. H. Blumberg.—p. 18.
Will simplified mass catering extend to the post-war era? S. F. B. Morse.—p. 28.
Sandwiches are what you make them. A. Easton.—p. 32.
*Here's how—to improve your dishwashing methods. A. G. Mezerik.—p. 34.

Hotels in the War Effort. Hotels are a vital factor on three important fronts: permanent housing, transient housing and public feeding, and furnish facilities for war meetings, local auxiliary services, and local drives. Resort hotels are important from three standpoints: use by armed forces, for housing and feeding war workers, and for "war vacations." Comparatively few vital employees must be retained for hotels to continue to operate. Hotels are curtailing service to an absolute minimum need basis and are conserving supplies and materials, but sufficient must be kept available to maintain basic hotel service.

Waitresses. "One can still get efficient waitresses if one will but advertise in an unusual way," says Judson Ryon, who has applied the knowledge of human nature he learned in the newspaper business to display advertising with good results in finding and employing waitresses for his "Natural Food Restaurant."

Tenderloining a Trout. A step-by-step pictorial story gives the proper method of preparing fish. Scale, slit the underside, remove the entrails, and wash the inside. Cut down to the backbone just behind the gills. Cut along the backbone on both sides. Lay fillets out flat and cut away or pull out the ribs. Remove the skin.

Planning a Kitchen. Two chief points to remember in designing and equipping any kitchen: (1) an inefficient kitchen requires additional staff; (2) when waiters are required to cross each other's paths or to take unnecessary steps, noise and confusion, increased accidents and breakage, and slow service result. The various stations in the kitchen should be arranged in logical sequence so that the waiter can progress from one point to the next without "back-tracking"; the waiter "should travel only in one direction." The best plan for any kitchen calls for a square area, next best a rectangle with the dining room entrance in or near the center of one of the long sides. Allow more space than it is estimated will be needed, rather than less.

Dishwashing. A good dishwashing compound should control the hardness of water without depositing a film or scale on dishes; emulsify food fats; break down and collect other food solids; assist in wetting glass, china and metal surfaces readily; and rinse freely. A dirty machine will not clean dishes and eventually will break down. Avoid dirty wash water; keep strainer pans and drains free from clogging; check spray nozzles for clogging frequently; change water frequently to avoid soil accumulating in tanks; whenever wash water is changed, rinse or hose machine with clean hot water. Charge wash tank or tanks with compound; fill tank or tanks with wash water not over 140° F. When full, close fill valves; place compound in the dispenser; run machine 3 minutes before washing any dishes; wipe dishes before placing in the machine, and allow sufficient space for wash water to strike all parts of the dishes; rinse dishes thoroughly with water at a temperature of at least 170°; when wash water becomes dirty, change it; don't allow refuse to pile up on strainers—rinse off regularly; the machine should be hosed and rinsed out at least once a day.

ICE CREAM TRADE JOURNAL

Vol. 39, July 1943

*Ice cream body-building with limited milk solids. P. H. Tracy and H. Pyenson.—p. 12.
*Supplies and equipment outlook. G. Lamont.—p. 20.
*War rulings affecting the ice cream industry. B. Terhune.—p. 26.

Vol. 39, August 1943

*War rulings affecting the ice cream industry. B. Terhune.—p. 26.
*Rules for sanitary control more urgent than ever. B. I. Masurovsky.—p. 28.

Ice Cream Body-Building. Studies have been made on the use of vegetable solids to stretch the amount of milk solids allotted to the ice cream industry, thus making possible the manufacture of a greater volume of ice cream. The vegetable solids used were soybean flour (low-fat), oat flour, wheat flour, and certain proprietary products. From the studies the following conclusions were drawn: flours increase the viscosity of the mix and improve

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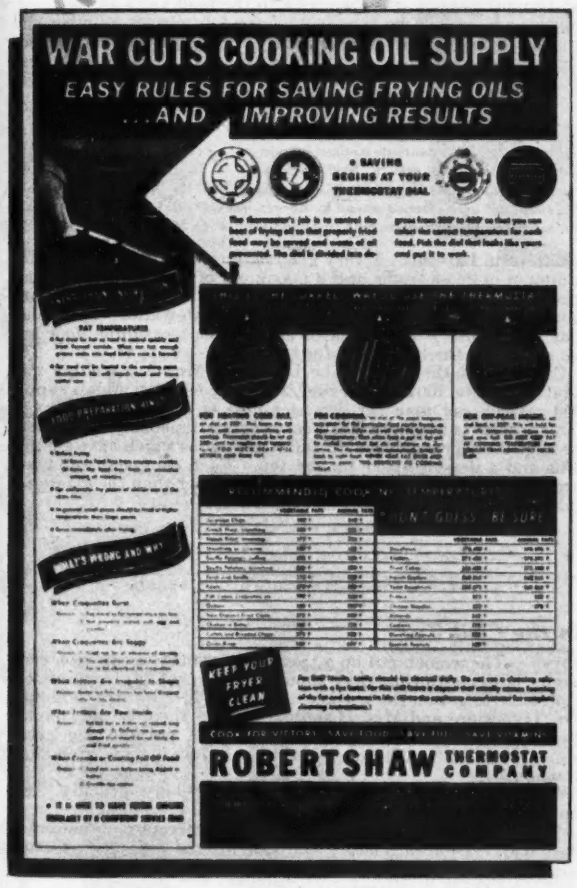
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the body of the ice cream; amount of flour added should be limited to from 1 to 3%, depending upon the kind used; wheat flour has less effect on flavor than oat or soybean flour; with the exception of a flour containing added vegetable fat, salt, and lecithin, all flours slowed whipping when gelatin was used as stabilizer; flours are not considered a serious source of bacterial contamination of the mix; the flours varied in moisture from 7.1 to 13.5%.

Supplies and Equipment. "If it works for you—make it last!" The following equipment is no longer being manufactured for the ice cream industry except on order by and for the direct use of the Army, Navy, Maritime Commission and War Shipping Administration: batch measures, batch weighers, fruit feeders, flavor tanks for mix, freezers, cup and package fillers, coating and dipping machines, bar and popsicle machinery, cutting and wrapping machines, cabinets, and metal ice cream cans. Sanitary pipe and fittings, instruments, sanitation products, ice cream flavoring products, and stabilizers are available in limited but, it is believed, adequate quantities. The situation on the limited output of corn sweeteners is quite serious, and nuts are expected to be scarce.

Ice Cream Industry. There is a shortage of corn sweeteners because of lack of corn in the refineries. FDO 8 revision permits quota-free shipments of ice cream to contract schools housing military trainees, etc., and ship's operators under contract with the government. Ice cream production has been classified as an essential wartime activity. The chocolate shortage may be relieved but the fruit supply for use in ice cream remains uncertain.

War Rulings. Late war rulings for the ice cream industry are a 10% raise in the sugar quota, in addition to 65% of the corn sweetener used last year in cane, if the manufacturer is unable to obtain corn sweetener; more coffee for coffee ice cream; approval of the pool plan for ice cream delivery; and an extension for 2 months of the price regulation covering the reduction in butter fat.

Sanitary Measures. Recontamination may be due to excessive handling of ingredients used; conditions of containers and closures after they have been in the plant a few weeks; the method of dispensing ice cream, etc. A few of the measures essential for maintaining high standards are to clean all equipment thoroughly before sterilizing; train employees in personal hygiene; guard against contamination in or on containers; avoid open seams in pipes; and check on condensation from contaminated surfaces dripping into clean storage vats.

INDUSTRY

*Industrial sanitation.—p. 25.

Industrial Sanitation. Specifications for industrial sanitation and hygiene have been prepared by industrial and health engineers, and promulgated by health authorities, based upon long experience and research and conforming to generally accepted rules of health and comfort. Rules are issued for the following plant sanitation facilities; water supply, drinking water, sewage disposal, toilets, lavatories and washing facilities, showers, dressing rooms, protective equipment, rest room, lunchroom and first aid and medical services, also housekeeping, ventilation, lighting, and temperature control. These rules are fairly uniform throughout the country, except for variations called for by climatic differences and adequacy or lack of public water supplies.

NATION'S SCHOOLS

Vol. 32, August 1943

Peanuts in menu planning. E. N. Todhunter.—p. 54.
*Shorten and season with peanuts. H. H. Thompson and J. G. Woodroof.—p. 56.

Vol. 32, September 1943

*Federal aid to school lunches. R. S. Carpenter.—p. 50.

Shorten and Season With Peanuts. Experiments conducted at the Georgia Experiment Station reveal that finely ground paste made from half roasted, blanched peanuts can be substituted for shortening in loaf bread, gingerbread, biscuits, cornbread, hot cakes, waffles, muffins and pastries. In standard recipes 2¼ times as much paste as the amount of shortening called for in the recipe with some additional liquid, is required. Ground, blanched peanuts are excellent for seasoning most vegetables, in the proportion of 3 oz. to 1 lb.

School Lunches. The actual aid given by FDA will cover only 60% of the cost of the food required to serve a nutritionally adequate lunch or about 35 to 40% of the cost of operating the lunch project. The reimbursement rate is in proportion to the nutritive value of the meal. The maximum indemnity is $.09 for each child and proportionately less according to the food value of the meal. Records which must be kept include food purchases, number and type of meals served, and number of children served without charge.

RESTAURANT MANAGEMENT

Vol. 53, August 1943

Four multi-purpose restaurants planned for post-war service. F. Keally.—p. 14.
Plastics in the post-war era. F. Keally.—p. 16.
*Planning a cafeteria for flexible service. F. Keally.—p. 17.
*Will simplified mass catering extend to the post-war era? S. F. B. Morse.—p. 24.
How careful cooking conserves both fuel and food. A. G. Mezerik.—p. 31.

Cafeteria Lay-out. A very good cafeteria set-up is one with a minimum of cross traffic and a maximum of comfort and appearance, with a solid wall separating the counter from the dining room. Soiled dishes are sent down on a dumb-waiter which is not near the counter. An escalator goes to the mezzanine floor and has stands on the hand-rails for trays.

Catering for the Navy. The Hotel Del Monte is feeding 1500 aviation cadets, 100 enlisted men, and some nurses. Meals supply 5000 calories per man per day at a cost of $.50 on the average. Table service is used and meals served simultaneously throughout the huge dining room from 15 insulated wagons which have 4 partitions and a dessert space on the top. Each compartment takes care of 1 table. This type of service is quicker than the cafeteria-style and the cost of serving is comparable.

Food Management in the Civil War

BY THE AUTUMN OF 1862 the army numbered well over 1,000,000, and 1,000,000 more were to be raised as fast as they could be provided for. But every regular channel of supply was overtaxed. Adequate food for the army could not be obtained. The War Department decided that the total womanpower of the country, which had so far organized itself without much official encouragement, was now to be systematically mustered, with the utmost cooperation of government. The problems of the army for the coming year were laid before the women's societies. Every type of small and voluntary agency for the manufacture of clothing and the raising and processing of food must be pressed into service. Transportation must be organized.

Scurvy had broken out in the western armies, so vegetables must be added to the army diet—as the women had argued all along. But how to get more vegetables? The answer was the appointment of a Sanitary Commission leader, Mary Livermore, and her able assistant, Jane Hoge, as food and supply dictators. These two staged a long speaking-tour, organized women's societies, with men associates, set them up in workrooms, established training classes, and assigned each community a food and supply quota.

Potatoes and onions eaten raw were the standard preventive of scurvy. The women put on a tremendous potato-and-onion campaign, rightly surmising that, though these vegetables were almost impossible to get on the market, there were large stores in hiding. Mrs. Livermore and Mrs. Hoge had every village in the country plastered with posters saying, "A barrel of potatoes for every soldier." "Don't send your sweetheart a love letter. Send him an onion."

"With potatoes and onions," said one lady proudly, "we captured Vicksburg."

Mrs. Livermore and her associates furthermore promoted a Civil War version of Victory Gardens around every army camp that provided fresh vegetables for all military hospitals, and a surplus for the men on active duty.

Pennsylvania women, in addition to planting their rich fields with vegetables for the army, invented "movable icehouses" which could be transported on the railroads. These were among the first refrigerator cars, and soon fresh meat, butter, milk and vegetables were run out of Philadelphia to supply the armies.—*From Lincoln's Daughters of Mercy by M. B. Greenbie, scheduled for fall publication, as condensed in Reader's Digest for August 1943.*

ALL-BRAN *recipes are "tailor-made" for* DIETITIANS

WHEN it comes to giving demonstrations, there are so many ways in which KELLOGG'S ALL-BRAN can be used in cooking, it's a regular "dietitians' delight"!

Not only does ALL-BRAN go to make nutritious and delightful dishes—breads, cookies, entrées, etc.—but when eaten in amounts equivalent to regular one-ounce cereal servings, dishes containing KELLOGG'S ALL-BRAN are just as effective as the cereal itself in correcting the cause of constipation due to lack of "bulk" in the diet. Just eat them regularly and drink plenty of water. ALL-BRAN is made by KELLOGG'S in Battle Creek, Mich.

KELLOGG'S ALL-BRAN recipes are "tailor-made" for dietitians! Write for a set today. Meanwhile, here's a deservedly famous recipe—try it!

ALL-BRAN MUFFINS

One muffin: 2½ inches in diameter; use 2 ounces mix or No. 16 scoop

Ingredients	*8 Dozen (12 lbs. 8 oz. mix)*
Shortening	13 oz.
Sugar	1 lb. 8 oz.
Eggs	12 (1 lb. 5 oz.)
Kellogg's All-Bran	1 lb. 8 oz.
Milk*	2½ quarts
Flour	3 pounds
Baking Powder	4 ounces
Salt	1 ounce

1. Blend shortening and sugar thoroughly; beat in eggs, All-Bran and milk; let stand for approximately 15 minutes.

2. Sift dry ingredients and add to first mixture, stirring only until flour disappears.

3. Fill greased muffin pans two-thirds full. Bake in moderately hot oven (400° F.) about 30 minutes.

*If sour milk or buttermilk is used in place of sweet milk, add one teaspoon soda for each pint of milk used and decrease baking powder by one-half.

News Notes

Meeting of the American Hospital Association. The forty-fifth annual convention was held September 13–18 at the Statler Hotel, Buffalo. The session on "Dietetics" September 17, under the chairmanship of Lenna F. Cooper, included the following subjects: "The Challenge of the Personnel Shortage"; "Balancing the Diet Under a Rationing Plan"; "Recent Advances in Clinical Medicine and Their Relation to the Field of Nutrition"; "Filling the Dietetic Prescription in Wartime"; "Educational Problems in the Department of Nutrition" and "The Army's Need for Dietitians."

Food Fights for Freedom Campaign. WFA and OPA jointly held meetings to discuss this campaign September 28 in Chicago, New York, and Washington, to which representatives of various groups and organizations all over the country were invited by the Group Services Branch, Consumer Division, OPA.

Food Selection and Cooking Lessons Revised. The Nutrition Committee of Greater New York, 105 East 22 Street, New York, has announced that a revised edition of the "Course of Lessons in Food Selection and Cooking" has been printed. In the revision, special consideration has been given to adjustments in meal planning because of rationing and other wartime conditions. The set of 6 lesson plans, which sells for 20 cents, covers the following subjects: dairy products; vegetables and fruits; breads and cereals; meat and fish; eggs, dried beans and peas; and meal planning. A quiz is also included.

Nutrition Program Materials. Received too late for comment in the October JOURNAL was a bulletin from the USDA on "Preservation of Vegetables by Salting or Brining" by John L. Etchells, Agricultural Research Administration, and Ivan D. Jones, North Carolina Agricultural Experiment Station, in which the method described on p. 620 of this JOURNAL for September and several other methods are presented in detail. This is an excellent manual and suitable for home or institutional use. A description of commercial application of the methods is also included. The illustrations are especially good, and ample tables are inserted. The sources of information on which some of the material is based constitute a useful reference list. The bulletin is sold by the Superintendent of Documents, U. S. Government Printing Office, Washington, at 5 cents.

Oklahoma A. & M. College Experiment Station Circular C-104, "Mung Beans for Oklahoma," summarizes available information on this new crop, according to an announcement in the Stillwater *Daily News-Press*.

Practical results of research on the dehydration of vegetables are presented in a bulletin entitled "Commercial Dehydration of Vegetables and Fruits in Wartime," prepared by the Agricultural Research Administration. Included are some of the findings of the laboratory established at Albany, California, as well as facts about dehydration for farmers, Victory Gardeners and the general public, and information for commercial processors. Single copies are available free upon request from the Division of Publications, U. S. Department of Agriculture, Washington 25.

A song book, "Nutrition Notes," for use in teaching children, has been published by Madeleine P. Grant, Sarah Lawrence College, Bronxville, New York. In this book, rhymes incorporating nutrition principles are set to familiar music. Copies of the song book may be obtained at 25 cents per copy and at lower prices when ordered in quantity. Copies of the printed words only sell for 1½ cents each, or less in quantity.

Consumer Time radio program, broadcast each Saturday at 12:15 p.m. EWT, has scheduled a series of talks by representatives of government agencies, each of whom discusses one of the Basic 7 food groups. Speakers include: Judge Marvin Jones, Marjorie Heseltine, Dr. Walter Wilkins, Dr. William H. Sebrell, and Margery Vaughn.

Five new wartime homemaking booklets have been added to the series of 9 recently released by General Electric's Consumers Institute, offering a practical course in improved methods of wartime homemaking. All of the booklets, which are titled "Home Canning Made Easy"; "Short Cuts to Fine Laundering"; "Know Your Home Wiring"; "Pack a Lunch That Packs a Punch"; and "Frozen Foods—How to Prepare, Freeze, Package, Cook"; may be obtained free from General Electric appliance dealers or the Consumers Institute, Department 1B, Bridgeport, Connecticut.

National Food Situation. FDO 78, effective September 1, makes peanuts available in the same quantities as in the calendar year 1942 for edible peanut products, and for salting, frying and roasting. Allocation of the anticipated supply also will provide sufficient peanuts for substantial increases in the production of peanut butter and peanut oil to meet war requirements. According to the FDA release, more peanut butter is needed for United States civilians to supplement other spreads and assist in the consumption of larger amounts of bakery products, principally bread.

On September 2, WFA announced that quotas for tea packers and wholesale receivers would be increased one-fifth for the current and subsequent quarters. Improved shipping conditions have resulted in more tea being imported than had been anticipated. FDO 5, as amended, which restricted the sale and delivery of packaged chicory, was terminated by WFA September 3.

WFA, in a release dated September 4, urged consumers buying fruits and vegetables in bulk to return empty containers to dealers to help relieve a critical shortage of wooden containers, including crates, hampers, boxes, and baskets.

The 1943 rice crop in Italy, harvested mainly in September and October, was expected to fall below the high level attained in recent years, USDA's Office of Foreign Agricultural Relations reported September 9. Italy is normally a large exporter of rice. The crop will probably be sufficient to meet domestic requirements at existing rationing levels. This report, however, may be modified in view of the following statement which appeared in the OWI release: "Should the Nazi forces make a stand in the area of the Po valley the customary distribution of the new crop within the country would prove to be impossible." In recent years yields of rice per acre in Italy have been the highest for any country in the world. The shortages of fertilizers and labor may prove to be serious handicaps for the 1943–44 crop. Rice in Italy is grown as a single crop and also as a second following winter wheat.

WFA reported September 10 that deliveries of edible fats and oils to representatives of Soviet Russia during the first 7 months of 1943 totaled 264 million pounds. Vegetable oils, mainly linseed oil, constituted by far the most important single item. Also included were lard and other shortenings, butter, oleomargarine, tallow, and oleo oil. It is estimated that per capita consumption of fats and oils in Russia in June 1943, the last period for which information is available, was less than half that in the United States. Linseed oil, largely utilized in paints in the United States, is used by the Russians in bakery products, for frying, on salads and cooked cereals. Lard has become a spread for bread, taking the place of butter among the civilian population. Most of the butter and oleomargarine goes to the army and to hospitals.

West Coast packers were authorized to release from 120,000 to 130,000 tons of dried raisins and prunes from their 1943 production for sale to civilians, WFA announced September 10. Additional quantities will be released later.

FDO 80, effective September 20, restricted the sale of Concord-type grapes for fresh consumption in 5 heavy commercial producing regions to assure the availability of supplies of processed grapes for the manufacture of increased quantities of jams, jellies, and fruit butters. This is in line with WFA's plan to increase the civilian consumption of bread by providing ample supplies of bread spreads.

The National Food Situation for August (received in September) states that total food production this year is expected to exceed last year's record high production by 5% and will be 32% above the prewar average, despite wartime restrictions and unfavorable weather. Substantial increases in livestock production will more than offset a 9% decline in food crops. With war requirements expected to absorb about one-quarter of the total production, the per capita civilian supply for the year as a whole will be only slightly larger than the consumption in 1935-39.

It is also stated that revised estimates indicate a total meat production in 1943 of 24 billion pounds—by far the largest on record. The increase will come mainly from pork production, which is now estimated to be 20 to 25% above last year's. Federally inspected slaughter of hogs is continuing at a high level. Federally inspected cattle and calf slaughter, however, is substantially below last year. It is assumed that a greater than usual proportion of the available supply of cattle and calves is being diverted to non-federally inspected slaughter. Supplies of chickens for the remainder of 1943 will be considerably larger than the previous record established in 1942. Egg production is expected to continue larger than a year earlier throughout the remainder of 1943. The August 1 crop report indicated an aggregate deciduous fruit and grape production about 17% below last season's; citrus fruit production, about as large as in 1942–43; truck crops for processing, the same as in 1942; potatoes and sweet potatoes, 19 and 24%, respectively, larger than in 1942; civilian supplies of potatoes for the 1943–44 marketing season, somewhat larger than in 1942–43. The indicated wheat production, together with a 618 million bushel carryover on July 1, will be sufficient to meet essential requirements. Improvement in the corn crop is also

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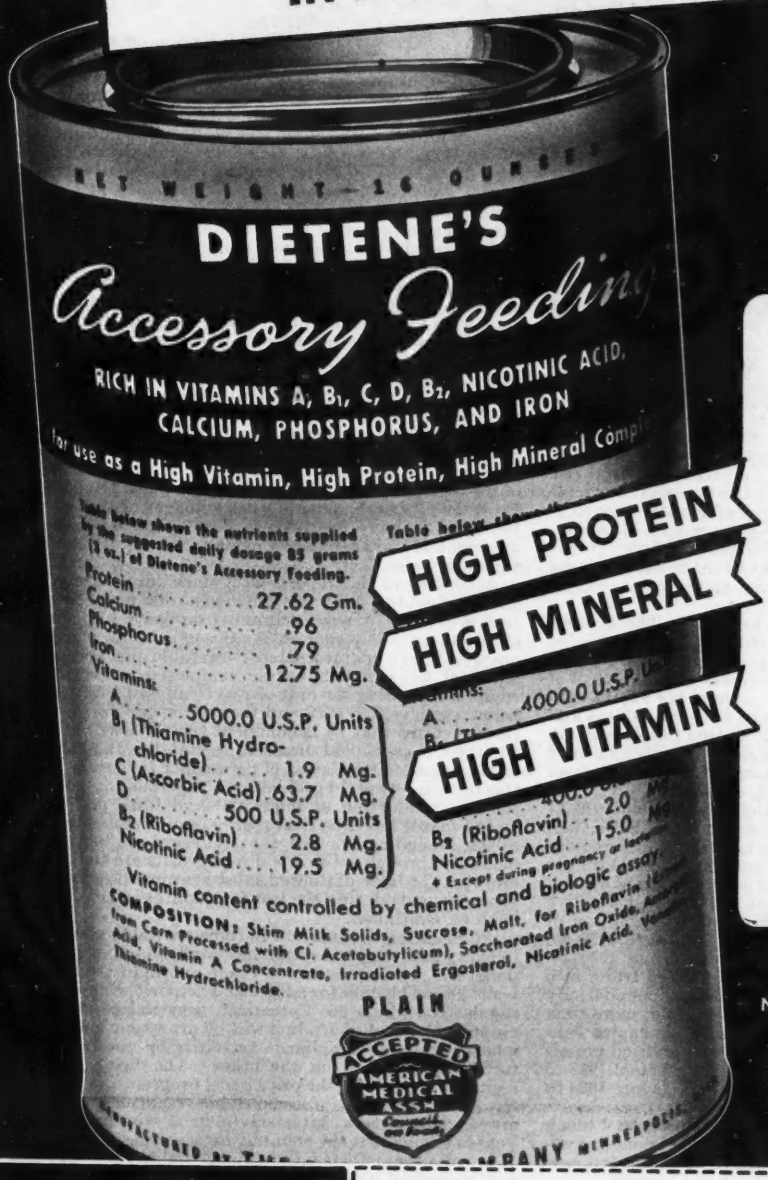
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C (Ascorbic Acid) 63.7 Mg.
D 500 U.S.P. Units
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indicated. Facts and figures on which these forecasts are based are covered in detail in the report.

According to the September *Dairy Situation*, total milk production during the second half of 1943 is expected to decline by more than the usual seasonal amount. Although sales of fluid milk and cream will be restricted, the quantity of milk available for manufacture may be considerably smaller in the last half of 1943 than in the corresponding period of 1942. This will be reflected mainly in decreased production of cheese, butter, and dry skim milk. Evaporated milk production, however, may be almost as large as a year earlier. Under present conditions, milk production for the United States in 1944 may total about 115 billion pounds, compared with 118 in 1943 and 119 in 1942. Unless in-shipments of feed are stepped up sharply, largest decreases may take place in the North Atlantic and Pacific Coast states, with some decline in the North Central states, and a slight increase in the South. WFA, effective September 10, authorized the Director of Food Distribution to limit sales of fluid milk and fluid milk products through a system of dealer quotas.

The August *Livestock and Wool Situation* predicted that the 1943 lamb crop would be 31,100,000 head, 1,500,000 smaller than last year's crop and the smallest since 1939. Reduction in the western states was due largely to a shortage both of experienced help at lambing and of ammunition for use against coyotes.

A 46-page statistical report on the production and consumption of fruits, 1909–40 has been published by the Bureau of Agricultural Economics, USDA, with the following introductory remarks: "Since the advent of food rationing the attention of the nation has been sharply focused on the domestic food situation. Current information on food supplies and their disposition is furnished monthly by the Bureau of Agricultural Economics in *The National Food Situation* and in the monthly *Crop Reports* [both of which are quoted in this section of the JOURNAL. Ed.] but in order to appraise our current and future food supplies, it is necessary to analyze the production and consumption of foods in the past. In March 1941, the Bureau of Agricultural Economics published a bulletin entitled *Consumption of Agricultural Products, 1909–39*. Since that time additional research has been undertaken to revise and enlarge the historical series on the production and consumption of food. *Production and Consumption of Fruits, 1909–40* is the first of a series of bulletins embodying the results of this research to be published by the Bureau. Comparable data for 1941 to the present time may be found in current issues of *The National Food Situation*. Because of war censorship, no trade data can be published for this latter period."

Following are a few highlights from the report: The average annual per capita consumption of fresh fruits during the period 1909–40 was approximately 144 lb., showing a slight upward trend. The per capita consumption of apples decreased, while that of citrus fruits steadily increased. Average annual per capita consumption of citrus fruits more than doubled between 1910–14 and 1935–39. The fresh fruits produced in the United States were by far the major source of supply. Bananas and pineapples account for more than 90% of total imports. Exports and shipments from the United States averaged less than 4% of total supply. The quantity of fresh fruit used for processing tripled from 1910–14 to 1935–39. Per capita consumption of canned fruits more than tripled from 1910–14 to 1935–39, averaging less than 4 lb. annually (net canned weight) in the former period and more than 14 lb. per capita in the latter years. The estimated consumption of canned peaches, pineapple, and cherries showed the greatest relative increase during the period 1909–40. Per capita consumption of canned pears increased about threefold from 1910–14 to 1935–39, and other canned fruits showed sizable gains. From 1910–14, the average annual imports and shipments of canned fruits into the United States amounted to about 108 million pounds. By 1935–39 this average had increased more than fivefold, more than 90% of which was canned pineapple. Average per capita consumption of dried fruit increased about 50%, and of dried prunes alone, over 100%; of canned fruit juices, from 1 lb. before 1932 to 8.7 lb. in 1940; of frozen fruits, from less than 1 lb. before 1938 to 1.1 lb. in 1938–40.

An amendment to General Ration Order 5 allows school lunch programs and nursery schools a more generous use of noncommercial supplies of canned fruit and vegetables, to be charged at current point values.

According to WFA's *Food Letter*, September 24, for the first time in history the California crop of oranges promised to be gone before the Florida and Texas crops reached the market, which meant that "by the last week in October an orange on the market will be rare as a rubber glove."

FDO 81 rules that oil of peppermint is to be reserved by owners pending government action. Supplies are very short this year, due to a drought in production areas in this country.

The *Cold Storage Report*, September 1, released September 15, announced substantial increases over August 1 stocks of frozen fruits and vegetables, butter, cheese, frozen poultry, frozen and cured beef, frozen lamb and mutton and lard, while holdings of eggs (shell and frozen), frozen and cured pork, and trimmings were reduced.

WFA directed October 1 that the lower grades of apples produced in specified areas in 8 states may be sold only to authorized processors. Most of these lower grade apples ordinarily would be used for processing, but the demand for fresh fruit is so great this year that the fresh fruit market would receive a disproportionate amount of the fruit unless controls were established, officials stated.

Effective October 2, one-sixth of the unshelled merchantable walnuts offered for shipment from Washington, Oregon, and California, will be set aside for shelling to help meet large requirements, as provided in FDO 82.

WFA announced October 1 that large production of dehydrated carrots and sweet potatoes has made these products available for use by restaurants, hotels, bakeries, and other institutional users. FDO 30, which reserves dehydrated vegetables for war needs, was amended last summer to permit the sale of dehydrated carrots and sweet potatoes to civilian users. The Restaurant Division of FDA's Wholesalers and Retailers Branch plans to provide restaurants with a carrot pie recipe originated recently at the Quartermaster's school for cooks and mess sergeants at Camp Lee, Virginia. Wholesalers and jobbers who usually supply institutions have been informed of the availability of these two dried foods and provided with names and addresses of processing plants.

Progress Report of OPA. In a report dated September 13 on the reorganization and new policies of OPA since he was appointed general manager, Chester Bowles stated that on July 29, in accordance with an amendment to the Appropriations Act, passed in June, in which Congress directed that no man should control price-making policies who had not had business experience, 6 of the 7 men who at that time controlled the price policies in the national office of OPA were relieved of their policy-making positions. A study of the field organization revealed that only 2 district directors were affected. Recent appointments have included: Reagan P. Connolly, vice-president of Marshall Field and Company and president of Interstate Department Stores in New York, as head of the General Merchandise and Distribution Division; and James Brownlee, formerly general sales manager of the American Sugar Refining Company, executive vice-president of General Foods, and president of the Frankfort Company, as deputy administrator in charge of price.

According to this report, OPA since July 1 had, through wage and price control programs, effected a total decrease of 1.5% in the cost of living. A new program is designed to decrease the cost of living an additional 2.3%, through lower prices on apples, oranges, onions, potatoes, lard, vegetable oils, and peanut butter; and work was soon to have been completed on a vegetable program which would bring the cost of practically all fresh vegetables well below the levels of 1942 and the winter and spring of 1943. Mr. Bowles states that he is confident the OPA will be able to carry out the Congressional directive to stabilize the cost of living at, or very close to, the levels of September 15, 1942. He added that this implies a twofold problem: the vigorous control of prices, and the full production of industrial and farm products. He also stated that it has been the experience of practically every country at war, including our own, that increased production costs can be met only through subsidies, if living costs are to be held in check, and that the issue of limited subsidies must be squarely met if the progress made during the last few months in the control of prices is to be continued.

All price regulations now in force are under careful review, and in every case where they can be simplified or clarified, this will be done, the report promises. Trade and industrial groups will be leaned upon heavily for advice and help in the development of new regulations which are "practical, easy-to-live with, and readily enforceable." A sharp line will be drawn between the voluntary educational and compliance activities on one hand, and the enforcement program on the other. The Price Department will continue to promote the price panel program as a means of keeping the retail merchant informed of his responsibilities. These local citizen committees, attached to local war price and rationing boards throughout the country, have increased in number to 5286. When all other efforts fail, habitual violators of the retail ceilings will be turned over to the Enforcement Department for appropriate action.

Funds may soon be available for the preparation of a simple pamphlet to be distributed to housewives listing OPA dollars and cents prices on all major food products. The Home Front Pledge Campaign (*see* p. 726 this JOURNAL for October) has already proved its effectiveness in reducing overcharges and curbing black markets where it has been tried out. A new, simple and more decentralized program of food rationing has been developed. A system of tokens, which will be used as change for food ration stamps, will be put into effect as soon as practicable, probably during the early winter months.

Vanguard Thinking in Nutritional Economics

AMERICA is growing up to her food responsibilities. With each day of wartime struggle and each plan for better post-war living, the realization grows that if ever we are to approach our ideal of an adequate diet for all of our people, we must learn to produce, distribute, and use foods more intelligently . . . less wastefully.

Fortunately, American scientific thinking and research have advanced far into this field of food economics. The intensive study of vitamins in the last two decades has thrown much new light—not only upon the essential factors of an ideal diet, but upon practical means of bringing the essentials within the reach of all income groups.

Modern margarine fortified with Vitamin A is an outstanding example of the application of such thinking. And it is the *wastefulness* of prejudice against this valuable low-cost food that many eminent nutritionists today deplore. For good margarine is a wholesome food which can be produced and distributed at a lower cost than butter to furnish the nutritive values which are the function of Group Seven in the balanced "Basic 7" daily diet. Margarine furnishes the same kind of "stick-to-the-ribs" food energy which butter does—and in which so many low-income diets have been found deficient. And margarine—with its laboratory-controlled fortification—is actually a more dependable *year-round* source of Vitamin A than butter is!

The makers of Nucoa realize that readers of this magazine may be familiar with the facts of margarine's nutritive value. If, however, you have not used Nucoa in your own home, you may not know how pleasing in taste and texture Nucoa is. When you serve it at your table, you will understand why so many who try Nucoa first in order to save money, or ration points, continue to serve it for pure eating *pleasure*.

A Product of THE BEST FOODS, Inc.

Nutritious

NUCOA

. . . a dependable source of

VITAMIN A

WHY NUCOA IS SO DELICIOUS

From American farms exclusively come Nucoa's chief ingredients—pure vegetable oils churned in fresh pasteurized skim milk. Nucoa was the first margarine to use only American vegetable oils and to achieve the smooth-churned, spreadable texture so different from old-time margarines. It was also the first margarine to be fortified with added Vitamin A.

Scientific research and control in one of the best equipped food laboratories in the world give Nucoa its dependable uniformity . . . in Vitamin A value . . . food energy . . . digestibility . . . taste . . . texture. 102 tests (54 on the oil alone) are made daily.

The delightful freshness of Nucoa spoils users for other spreads. Nucoa is freshly made the year around, on order only. There is no "storage" Nucoa.

U.S. NEEDS US STRONG
EAT THE BASIC 7 EVERY DAY
7 BASIC FOOD GROUPS ARE NEEDED DAILY FOR GOOD NUTRITION
This food is included in...
NUTRITION GROUP
SEVEN

The appointment of a deputy administrator in charge of information was expected to result in a far better understanding of the entire OPA operation in every community, and better cooperation.

Actual administration in the field has been transferred to the greatest possible extent to the district offices, which are closest to the local boards and the public. The 5400 local war price and rationing boards with their 52,000 volunteer members and their thousands of volunteer assistants will continue as the administrative backbone of the OPA. The number of employees at the national office has been reduced from 4676 to 4321 and will be further reduced to 3950. In the regional offices, personnel reductions between June 30 and October 15 totaled about 900. Eleven district offices in various parts of the country have been eliminated.

Potatoes. According to vegetable specialists of USDA's Research Administration, small lots of potatoes may be stored successfully in any one of several ways. Three factors, especially, must be considered: they must be kept from freezing, from getting too warm, and a dark place is essential. As soon as they have dried off after digging, the potatoes may be stored in ventilated barrels, boxes, baskets or crates in a cool storage room in the basement or cellar. They are of better quality for current home use if kept at 50 to 60°F. than if stored at lower temperatures—they are not so likely to get sweet, and they cook better. Other storage methods consist of piling in outdoor root cellars, or in pits or banks. When put in pits or banks, potatoes must be covered with alternate layers of straw or leaves and soil to prevent freezing. The pits or banks may be opened occasionally to remove potatoes and the opening re-covered with leaves and soil.

Various storage facilities for potatoes and other vegetables are described in Farmers' Bulletin 1939, "Home Storage of Vegetables and Fruits," single copies of which may be obtained free by writing USDA, Washington 25.

Irish potatoes were designated as a Victory Food Selection for the period October 21 through November 6 by FDA's director, Roy F. Hendrickson, on September 25. Food merchants, proprietors of eating places, distributors, advertisers, and those responsible for disseminating information to the public were urged to feature Irish potatoes, focusing consumer attention on the seasonal abundance of this crop.

"Potatoes in Low-Cost Meals," a pamphlet mentioned before in this JOURNAL, is now on sale by the Superintendent of Documents, Washington, at $1 per 100 copies, and is available free from FDA in small quantities.

Victory Garden Report. The 1943 Victory Garden program was an outstanding success, according to a statement made by Secretary of Agriculture Claude R. Wickard over the Blue Network, September 9. When the campaign was opened last spring the goal was set at 6,000,000 farm gardens and 12,000,000 town and city gardens. Later a nationwide poll placed the total number of Victory Gardens at 20,000,000. At a conservative estimate, the 1943 Victory Gardens totaled about 4,000,000 acres and should have produced 8,000,000 tons of food. It is estimated that a greatly increased supply of food is going into storage in pantries and cellars also.

The 1944 Victory Garden outlook appears bright, added Secretary Wickard. Information now available indicates that we shall have an ample supply of garden seed and fertilizer and that there will be a better supply of garden tools and equipment for spraying and dusting.

United Nations Interim Commission on Food and Agriculture. As a result of the conference on food and agriculture held last spring, the President invited a group of men to Washington to draw up plans for a permanent United Nations organization to deal with the problems of food and agriculture. One representative from each country—45 in all—made up the group which has been titled the United Nations Interim Commission on Food and Agriculture. Some of the aims and subjects of discussion at the conference were: full production in each country toward a world in which everybody is well-nourished, full industrial employment and expanded world trade, scientific farming methods, and conservation farming.

Institutional Management Course. Northwestern University recently absorbed the School of Domestic Arts and Sciences and is offering for the first time an institutional management program in the School of Commerce, according to the National Restaurant Association *News Letter*, September 22. Two courses offered this fall—"Restaurant Menu Planning," and "Nutrition," conducted by Alberta Macfarlane, educational director, National Restaurant Association, and Elizabeth Tuft, executive dietitian, Wesley Memorial Hospital—began September 24 and September 28, respectively, and will meet each week for 16 weeks. Total cost of one course is $31; for the two, $47.

Rationing and the Restricted Diet. Mrs. Eloise R. Trescher, dietitian, Johns Hopkins Hospital Clinic, writes as follows: "We have about 9000 patient visits per year, and so far I have recommended additional red points for only four persons, and extra blue points for only one. We have spent quite a little time explaining and interpreting, but not nearly so much as one would expect. Interpretation has placated all but two persons, and these were highly neurotic individuals."

Nutrition Institute for Public Health Nurses. Sponsored by the State Department of Public Health, a refresher nutrition institute for public health nurses was conducted by the School of Home Economics, University of Alabama, September 14–16. Speakers included Dr. Raymond R. Paty, president, University of Alabama; Dr. B. F. Austin, Dr. J. F. Hughey, and Pearl Barclay, State Department of Health; Dr. C. J. Fisher, Tuscaloosa County Health Officer; Dr. W. D. Partlow, superintendent of the Alabama Hospital for the Insane; Dr. J. S. McLester, Mable Adams, and Dr. E. Neige Todhunter of the University. According to Agnes Ellen Harris, dean of women, the program was arranged by Amanda Tucker, nutritionist, State Department of Public Health.

Holiday Dinners. According to the OWI *Magazine War Guide* for November-December, the prospectus for holiday dinners for Thanksgiving, Christmas, and New Year's Day is as follows: "Civilians will get their chance at the turkey crop beginning late in October. Only widespread public refusal to pay over ceiling prices will prevent tremendous black market operations this year. Many patriotic housewives will decide to serve something else—say roast chicken or shoulder of pork—rather than pay more than ceiling prices. Serve sweet potatoes, of course. The Irish potato crop can be held back for later winter use—they're what give the tang to the soups sent overseas. Use some of those canned vegetables from last summer's Victory Garden instead. Or, with production of frozen vegetables more than twice what it was in 1941 and civilians getting 70% of them, choose your favorite frozen food. There will be cranberries enough for home-made cranberry sauce, apples and nuts for that apple-nuts-cranberry concoction. The supply of mince-meat will be between 80 and 85% of normal. Nobody knows yet about the pumpkin supply for the pumpkin pie."

We understand that the demand for turkeys is expected to exceed the supply and that orders should be placed early. A seasoning for poultry stuffing made of sage, marjoram, thyme, and black pepper is to be on the market in good supply. It is suggested in another release that celery tops be dried and saved for additional seasoning. The indications are that there will be a record orange crop and that the Government will release more raisins for civilians than it did last year. Some of the cranberries will appear on the market dried.

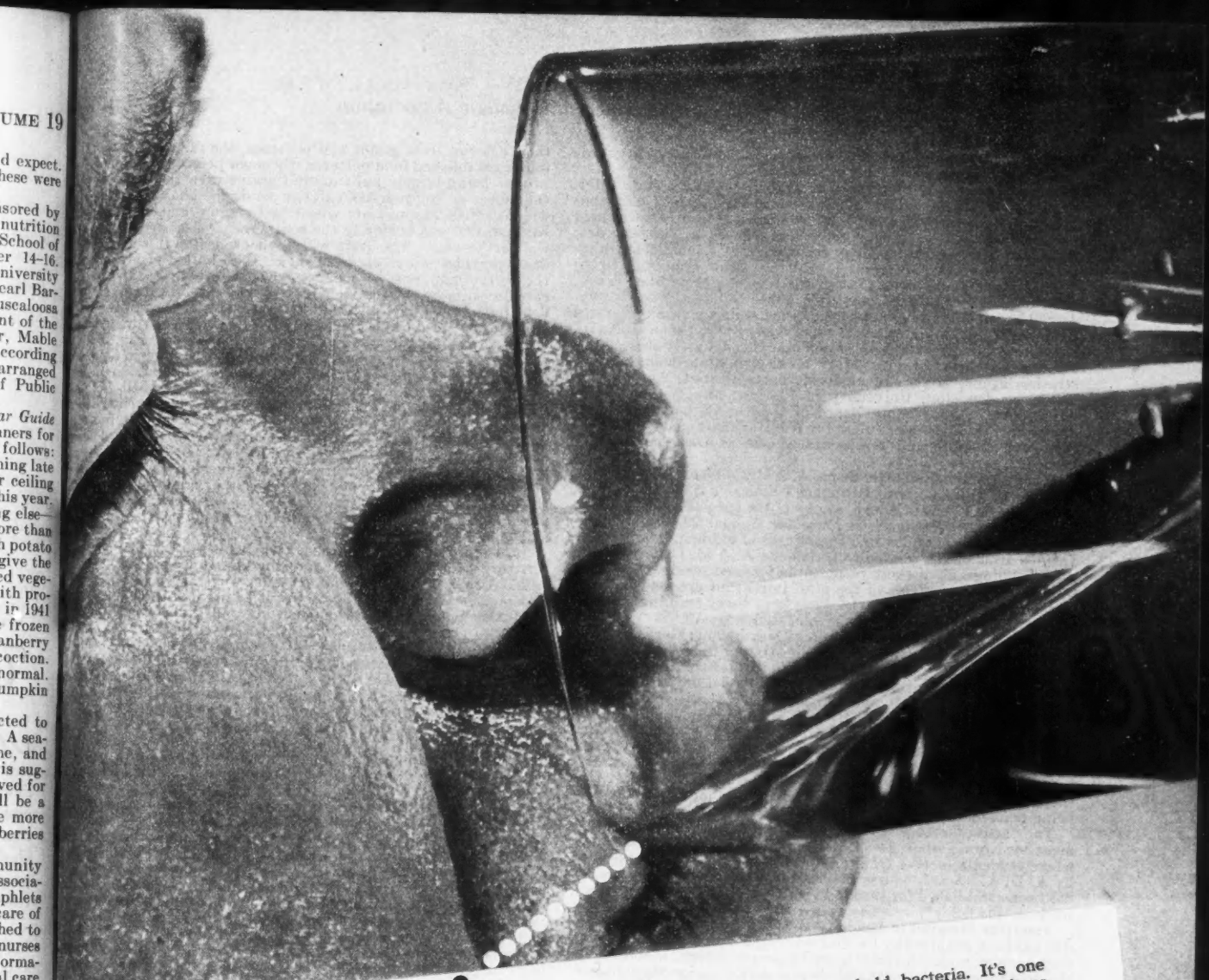
Releases on Dental Care. The Committee on Community Dental Health, the New York Tuberculosis and Health Association, 386 Fourth Avenue, New York, has released two pamphlets written especially for mothers, giving information on the care of their own and their children's teeth. These will be furnished to mothers and others interested and to physicians, dentists, nurses and social workers. The first booklet, "Sound Teeth—Information for the Expectant Mother," explains the need for dental care during pregnancy and advises as to proper care and diet during these months. "Sound Teeth—The Care of the Teeth in Infancy and Childhood," describes the development of a child's teeth, home care, diet, and exercise and explains one of the causes of crooked teeth—all in very simple, nonscientific language. The first of the three essentials for dental health listed in the second booklet is a well-balanced diet.

An article entitled "Nutrition in Relation to Teeth" by H. E. Hinman appears in *New Hampshire Health News*, State Board of Health, Concord, for May 1943.

Postwar Planning for Medical Services. At a recent meeting of a committee of the American Medical Association concerned with such services it was suggested that the committee be ready to appoint other subcommittees on such general topics as Nutrition, Infectious Diseases, Child Welfare, Maternal Welfare, Mental Welfare.

School Lunch Programs. The new wartime plan for community school lunch programs, as described in *Consumers' Guide*, September, differs from last year's in that while previously FDA bought foods as a part of the market stabilization program and sent them to state welfare agencies, who stored and distributed them to school lunch sponsors; now sponsors will buy certain food supplies direct from local farmers and merchants, and FDA will reimburse them for the cost up to a specified maximum amount, provided certain conditions are met. Foods for which FDA will reimburse sponsoring agencies will be selected according to nutritive value and availability. For further information, interested groups should address regional FDA offices where single copies of a booklet telling how to set up a community school lunch program are available free.

An abstract of an article on the school lunch program appears under the Current Literature section of this JOURNAL and a release of August 16, 1943, entitled "Education for Victory," U. S. Office of Education, Washington, gives an outline of the present status



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Daily contact with many lips . . . constant exposure to millions of bacteria. These can make any glass dangerous. Safety lies only in *super cleanliness*... the kind you get from Super Soilax.

Why? Because the fast, powerful Super Soilax cleaning action not only removes grease, eggs, lipstick, food debris. It makes short work of bacteria surviving hot water. *Not* by killing them through germicidal action, but by *removing* them with powerful mechanical efficiency!

There's another reason, too, why Super Soilax'd glasses, dishes, and silver are *cleaner than the eye can see*. Super Soilax, itself, forms no film to catch or hold bacteria. It's one dishwashing compound that softens water without creating *precipitates!*

For dishes and glasses that glow with health, for *lower bacteria count* per utensil — you can depend on Super Soilax and the famous Super Soilax Service. Economics Laboratory, Inc., St. Paul, Minn.

COST CONTROL! *Keep tabs on your dishwashing compound costs, stop waste—with Super Soilax Control Packages.*

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For mechanical dishwashing of china, glass, silver

of a federal provision which authorizes the expenditure of fifty million dollars for school lunch purposes.

School Lunches in Florida. The first meeting of a state Advisory Committee on School Lunch Programs set up by Colin English, state superintendent of public instruction, Florida, was held in Ocala, July 8–9. The membership of the group includes: Roberta Williams, chairman of School Lunch Committee, State Welfare Board; Dr. Margaret R. Sandels, dean, School of Home Economics, Florida State College for Women; Anna Mae Tracy, chairman, School Lunch Committee, State Defense Council; Mrs. Anna Carson Dunaway, chairman, Home and Community Service Division; J. M. Williams, state supervisor, FDA; Helen Holstein, associate state director, FSA; Anna Mae Sikes, nutritionist, Agricultural Extension Service; Mary E. Keown, state home demonstration agent; Dr. F. S. Jamison, horticulturist, Agricultural Extension Division, University of Florida; Mrs. Vera Walker, nutritionist, Florida State Board of Health; Catherine Walters, dietitian, Florida State College for Women; also members of other state departments and representatives of professional and lay groups.

Wartime Activities at Oklahoma A. & M. College. Through the courtesy of Nell Clausen, Milwaukee Children's Hospital, alumna of Oklahoma A. & M. College, a copy of the special college edition of the Stillwater *Daily News-Press* for August 29, has been received. One page is devoted to pictures of students training for various arms of the service at Oklahoma A. & M. College, and a group photograph of those responsible for food service, bears the following caption: "One of the most important groups who have worked in connection with the Army and Navy training stations at the college." Among those pictured are: Aletha Villareal, dietitian at the 90th college Training Detachment; Mary Gertrude Gray, purchaser; Ella Mae Smith, dietitian at Murray Hall; Marguerite Ross, chief dietitian; Maxine Klein, dietitian at the college cafeteria; H. Clay Potts, director, college food unit; Vivian Sears, dietitian at Cordell Hall, and Hattie Bentley, dietitian at Willard Hall. It is reported that the friendly and progressive spirit of the college has greatly impressed service men and women who have trained there (the largest WAVE school in the nation is at Stillwater) and that many plan to return for further courses after they have been released from duty. In addition to the candidates for the armed services, over 6000 workers for war industries are also being trained at the college.

The "acute shortage" of trained dietitians is stressed in a statement by Nora Talbot, Dean of the College of Home Economics, where students receive training in dietetics in a course approved by A. D. A. A new course in the Home Economics Department has been established for those interested in preparing for research work in this field.

American Hospital in London. A new general hospital in London has been acquired by the United States Army from the British Government under reverse Lend-Lease procedure, according to the *Journal* of the American Medical Association for September 4. The hospital is equipped with the latest technical apparatus, mostly of American design. There is a dental clinic and an x-ray department, and Capt. Miles Gullingsrud, it is said, sees that Army cooks provide "a healthful American hospital diet in food-rationed England. Eggs, cereal, fresh milk and vegetables are given by the British under reverse Lend-Lease, and extra eggs and milk are obtainable for special cases."

Mead Johnson and Company 'B Complex' Award. According to Dr. Arthur H. Smith, Wayne University College of Medicine, Detroit, and secretary, American Institute of Nutrition, this award is to be given to the laboratory (non-clinical) or clinical research worker in the United States or Canada who, in the opinion of a Committee of Judges of the American Institute of Nutrition, has published during the previous calendar year January 1–December 31, the most meritorious scientific report dealing with the field of the 'B complex' vitamins. While the award will be given primarily for publication of specific papers, it may be recommended that the prize be divided between two or more persons or the award may be made to a worker for valuable contributions over an extended period and not necessarily representative of a given year. Membership in the American Institute of Nutrition is not a requisite of eligibility for the award. Nominations for this award for work published in 1943 must be in the hands of the Secretary by January 10, 1944. The nominations should be accompanied by such data relative to the nominee and his research as will facilitate the task of the Committee of Judges in its consideration of the nomination.

Activities of OFRRO. An interview with Dr. Helen S. Mitchell, chief nutritionist, Supply and Transport Division, Office of Foreign Relief and Rehabilitation Operations, was quoted by correspondent Eleanor Darnton in the New York *Times*, September 10, in which the development of new foods, new sources of food, new forms of processing to defeat spoilage and save cargo space, and other activities of OFRRO were described. Dr. Mitchell stated that, "Since 50 to 80% of Europeans normally get most of their calories from grains and potatoes, the OFRRO policy is to follow established food patterns whenever possible, the basic food rations being largely built around grains with the aim of seeing that every person gets 2000 calories per day. The available grains which will be shipped are wheat, a common denominator to all Europe; rice and barley to the southern peoples; rye and oats to the northwest." The grain will be incorporated in such foods as dried porridge, complete with sugar, skim milk and vitamins for the northerners, unsweetened for the south where it is likely to be eaten with vegetables; spaghetti to which dried egg and soybean flour have been added; dehydrated soup powder containing whole grains, precooked beans and peas, soybean grits, dehydrated diced vegetables, with autolyzed yeast; a dry paste food mix, made of wheat flour, low-fat soybean flour, defatted wheat germ flour, and dehydrated egg for making quick breads, muffins and pancakes.

One of the great achievements, according to Dr. Mitchell, has been the perfection of a lemon drop as a successful carrier of vitamin C, each piece of candy providing almost enough to meet the minimum daily requirement for this vitamin. A limited amount of fish, meat and cheese will be sent abroad, most of it foods not ordinarily used by the American housewife such as a concoction of whiting, trout, and spots cooked together, another made from the bones and fish that sticks to the bones when fish fillets are prepared, and squid. A dehydrated cheese which can be made into a delicious soup or sauce will also be sent.

It is expected that when the OFRRO takes over in an occupied territory, which would be at any time up to 6 months after the Allied Armies occupy the land, an orderly system of food distribution on a family basis will be possible, according to this account.

Mexico Plans Broad Social Security and Public Welfare Program. A program planned by delegates to the First National Congress on Public Welfare, recently held in Mexico City, included a unified child welfare code to coordinate existing child welfare laws; organization of a Central Technical Council to draw up a child welfare plan on a national scale; complete maternity care; wider instruction in dietetics; and provision of free milk and meals for needy children, according to a release from the Office of the Coordinator of Inter-American Affairs in September. The Congress, sponsored by the Department of Public Welfare, was attended by over 400 delegates from Mexico and other American republics.

Information About Middle America. The Middle America Information Bureau, conducted by the United Fruit Company, 1 Rockefeller Plaza, New York, has announced that the following informational background material suitable for articles and speeches, for study, reference, practical business data, etc. is available free upon request: "Background Information on Bananas"; "Cocoa and Middle America"; "Spices Look Homeward"; "Outline for a Speech on Middle America for Women's Groups"; and (in preparation) "Essential Oils and Middle America."

Nutrition-in-the-Classroom Award. The F. A. Owen Publishing Company, publishers of *The Instructor*, have awarded first prize in a contest for an article on teaching nutrition to Fannie V. Quick, teacher in the Warsaw Grade School, Warsaw, Illinois. The article, which appeared in the September issue of the magazine, describes a year's plan for instructing grade school pupils which has proved successful and which contains some unique and interesting features.

Protein Requirement Studies. An account of the investigations on protein requirement of man, which were conducted by Drs. Fredrick J. Stare and George W. Thorne and described at the meeting of the American Chemical Society, appeared in the New York *Times* September 11. The studies were carried out by the Harvard University Fatigue Laboratory, with the cooperation of the Division of Nutrition of the Medical and Public Health Schools at Civilian Public Service Camp 32, West Campton, N. H. Some of the findings are reported as follows: "In the presence of sufficient calories from nonprotein sources, the amount of protein in the ordinary diet of an active adult may be safely reduced to 50 gm. per day, of which as little as 5 gm. may be in the form of animal protein. . . . The protein requirement is not increased in exercise, and physical fitness and efficiency are not impaired or improved on low-protein diets adequate in other nutrients. . . . High-protein diets are not harmful to the normal adult and are of definite therapeutic value in many diseases and particularly in convalescence. . . . No beneficial or deleterious effect was observed in 2 months from a diet providing 160 gm. protein, most of which was animal protein. . . . Lumberjacks may demand plenty of red meat to get their timber out, but that demand rests on habit and not on a nutritional or medical basis."

Booklet on Pickles. A new booklet, "New Facts About an Old Friend," has been published by the National Pickle Packers' Association, 233 North East Avenue, Oak Park, Illinois. Results of recent analyses of pickles for nutritive value are given, also descriptions of various types of pickles, and their use with other foods and in sandwiches. The booklet is available on request.

Dr. Wilder Returns to Mayo Clinic. The War Food Administra-

Can Proteins Really Be Graded?

Amino acids, the constituents of protein, are arbitrarily termed "essential" and "nonessential." Essential are the ten which cannot be synthesized in the body; nonessential, those that can be synthesized by combinations of the essential group.

All amino acids are found in protein foods whether of animal or plant origin. But in those of animal origin all the ten essential amino acids are present while the combination of all of them is comparatively rare in plant proteins. Hence these latter often have been termed "inferior proteins" and have been considered less important. Is such grading justified?

The function of the essential amino acids is twofold: a) replace in the tissues the "worn-out" members of their own group and enter the structure of newly formed tissues; b) aid in the synthesis of nonessential amino acids, if these are lacking. Thus the nonessential group is virtually of equal importance, since it spares the essential group from being used for their synthesis.

Hence all protein sources are of nutritional importance. This is of special significance so far as cereal-derived foods are concerned.

Cereal breakfast foods contain an average of about ten per cent of protein, their actual contents ranging from 7% to 14%, depending on the grain source from which derived. Their protein is highly acceptable to the human organism, contributing its share to growth as well as maintenance.

When one ounce (prepared cereal or its equivalent in cereals to be cooked) is served with four ounces of milk and a teaspoonful of sugar, this palatable dish presents about 7 Gm. of protein, biologically adequate through the contained milk, 33 Gm. of carbohydrate, and 5 Gm. of fat, a total of 205 calories, and appreciable amounts of B-complex vitamins calcium, iron, and phosphorus.

The presence of this seal indicates that all nutritional statements in this advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

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A cooperative effort to present the nutritional value of cereal breakfast foods (natural whole-grain or enriched or restored for vitamins and minerals to whole-grain values), undertaken jointly by THE CREAM OF WHEAT CORP. ... GENERAL FOODS CORP. ... GENERAL MILLS, INC. ... KELLOGG COMPANY ... NATIONAL BISCUIT COMPANY ... PILLSBURY FLOUR MILLS COMPANY ... THE QUAKER OATS COMPANY ... CAMPBELL CEREAL CO. ... ALBERS MILLING CO.

tion announced September 18 that Dr. Russell M. Wilder, who served from January to that date as Chief of the Civilian Food Requirements Branch, would return to his regular duties at the Mayo Clinic. He will continue to serve as Medical Adviser to FDA and will spend one week each month in Washington.

Henderika Rynbergen Receives Appointment. Miss Rynbergen, recently president of the New York State Dietetic Association, has been appointed Assistant Professor of Sciences, Cornell University-New York Hospital School of Nursing. Professor Rynbergen has charge of the courses in biochemistry and physiology, as well as those in nutrition.

Ration Cook Book Receives Commendation. At the annual meeting of the Iowa Hotel Association, Cedar Rapids, September 9, Demetria M. Taylor's *Ration Cook Book*, reviewed in this JOURNAL for July, was praised by one of the principal speakers, who said that his organization was using the book and that with it they were really "cooking for profit."

Maryland Dietetic Association. Officers for 1943–44 are as follows: president, Felisa Bracken; president-elect, Elizabeth Hedgecock; vice-president, Hilda McEwen; secretary, Frances Gibson; treasurer, Bernadine Buck; member of the House of Delegates, Helen Baughman; and alternate, Alice Jané. Section chairmen are: Community Education, Mildred Hearn; Diet Therapy, Colleen Cox Hambleton; Professional Education, Janet Engebretsen; Administration, Helen Schmidt; Program, Miss Baughman.

On September 21 the association sponsored a meeting in cooperation with the United States Army, in order fully to describe the work of the Army dietitian. Speakers included Col. Thomas W. Burnett, Chief of Medical Branch, Third Service Command, and Major Helen C. Burns, Director of Dietitians.

Eighty-three Dietitian's Aides in Baltimore have completed the Red Cross training program. The following hospitals have participated: University of Maryland Hospital, Johns Hopkins Hospital, Home for Incurables, St. Agnes Hospital, and Maryland General Hospital. Union Memorial Hospital will shortly graduate a class of 16.

Colleen Cox Hambleton has accepted the position of chief dietitian at Sinai Hospital, Baltimore. New members of her staff are: Jane Hartman, formerly of Torrance State Hospital, Pennsylvania; Bella Diskin, Mildred Jones and Shirley Friedlander.

Other appointments are as follows: Margaret Weskett, University of Pennsylvania Graduate Hospital, to Baltimore City Hospital; Alice Jané and Mrs. Beryl Boerner, West Allegheny Hospital, to Union Memorial Hospital; Judith Judd, University Hospital, to Massachusetts General Hospital; Mrs. Mary Varhol, to Johns Hopkins Hospital.

Students in training at University Hospital are: Sybil Bangs, Kansas State College; Polly Venning, Florida State College.

Students at Johns Hopkins Hospital include: Janette Carlson, Kansas State College; Li-An Shu, Elmira College; Hannah Segal, Simmons College; Elizabeth Gutel, University of Illinois; Frances Andersen, Cornell University; Carolyn Erb, Pennsylvania State College; Mary Frances Steile, University of Idaho; Janice Files, University of Texas; Josephine Logan, University of Manitoba; Elizabeth Tower and Marian Carr, Michigan State College; Vivian Meyer, University of Wisconsin; Barbara Hurst, University of Utah; Martha Williams, James Millikin University; Mary Jean Sloanaker, State College of Washington; Mary Jane Hartman, Ohio State University; Lea Himal, Montana State University; Ruth Hyer, Utah State Agricultural College; Kathleen Shoemaker, College of St. Catharine; Shirley O'Neal, Mississippi State College for Women.

Students in training preparatory to Army service are: Annaleen Hammer, College of St. Catherine; Betty Mae Stieg, Montana State College; Emily Lewis, Madison College; Gwen Taxelius, Washington State College; Lorene Swanson, Oregon State College; Janet Hammill, Drexel Institute of Technology.

New Jersey Dietetic Association. A Red Cross course for Dietitian's Aides was recently conducted at Beth Israel Hospital, Newark, with Sophia Morris, head dietitian, in charge. The course, the first of its kind in New Jersey, consisted of 40 hours—25 hours of classroom work and 15 hours of practical work.

A meeting of the association's Executive Board was held in September to make plans for the November meeting and the year's work.

Ohio Dietetic Association. Officers elected for 1943–44 are: president, Oliver Walker; president-elect, Alice H. Smith; vice-president, Minerva Harbage; secretary, Claire Goble; treasurer, Florence Seidel; member of House of Delegates, Marie Hines; nominating committee, Hazel Fullriede, Dorothy Ward Glazer, Elizabeth Sullivan, Olive Walker and Lulu Winans.

According to the *Ohio Dietetic Association News*, the Administration Section has been collecting recipes for nonrationed protein substitutes, and nonrationed foods to be used in institutions. The Professional Education Section has planned a recruiting program to interest high school students in home economics in order to meet the demand for trained dietitians.

The training course for graduate dietitians at University Hospitals, Cleveland, has been accelerated from 12 to 9 months, a certificate being granted after 3 months' work in the field.

Midshipman Margaret Alice Stewart, formerly a member of the Dietary Department, Cincinnati General Hospital, graduated from Midshipmen's School, Northampton, Massachusetts, July 27, receiving the commission of ensign, and hoped to be assigned to duty in foods work.

Alice Lagerstrom has a year's leave of absence from Ohio University to take hospital training at Presbyterian Hospital, New York City. Janet Charters, formerly dietitian in one of the women's residence halls of the University, has received her Army commission and is stationed at Bend, Oregon. Of the 12 recently graduated students majoring in dietetics and institution management, 8 have been accepted for approved courses, one is working as an assistant in a hospital and one is in an industrial cafeteria.

Eleanor Shuman, Anne Spehar, Eleanor Hurka, and Martha Pabst, all assistant dietitians at University Hospitals, have enlisted in the armed forces. Miss Hurka and Miss Spehar have volunteered for overseas duty.

Other recent appointments include: Mary Washington, chief dietitian, Aultman Hospital, replacing Henrietta Brubaker, now at Hamilton County Hospital; Kathleen Weber, Iowa State College, to Mayo Clinic; Patricia Weiser, University of Idaho, to Johns Hopkins Hospital; Julia Adams, Pennsylvania State College, to University Hospitals as assistant administrative dietitian; Marguerite Horn, Cornell University, to Frances Payne Bolton School of Nursing, University Hospitals; Ruth E. Martin, Western Reserve University, to Stouffer Corporation; Claire Means, Florida State College, Betty Thompson, University of Colorado, and Marjorie Esson, Massachusetts State College, to University Hospitals.

Philadelphia Dietetic Association held the first meeting of the 1943–44 season October 5 with Major Helen C. Burns as guest speaker. Home economics students of the following schools were guests: Temple University, Drexel Institute, Immaculata College, New Jersey State College for Women, and Beaver College.

Newly elected officers are: president, Marjorie Sims, Drexel Institute of Technology; vice-president, Evelyn A. Carpenter, Philadelphia Hospital for Contagious Diseases; secretary, Miriam E. Gaige, Jewish Hospital; and treasurer, Betty J. Brewer, Mount Sinai Hospital. The Executive Committee is headed by Henriette A. Pribnow, director, Dietary Department, Jewish Hospital; and includes Eleanor M. Bigelow, nutrition consultant, Visiting Nurse Society of Philadelphia; and Maxine M. McCown, Osteopathic Hospital. Joan M. Larivee, Horn & Hardart Baking Company, is chairman of publicity. Section chairmen are: Administration, Julia E. Amerise, Woman's Hospital; Community Nutrition, Miss Bigelow; Diet Therapy, Sister Maude Behrman, Lankenau Hospital; and Professional Education, Grace Godfrey, dean, School of Home Economics, Drexel Institute of Technology.

Dr. Helen Farrankop, Temple University, has accepted an appointment on the faculty of the University of Arizona.

News From Our Advertisers and Exhibitors. Ethel Austin Martin, director of the Nutrition Service of *National Dairy Council*, 111 North Canal Street, Chicago, announces that a booklet entitled "Ice Cream From Farm to Family" giving a complete account of the manufacture of ice cream, is now available upon request. The report has been prepared primarily for use by students of the upper grades and high school and tells the story of the progress of the ice cream through the laboratory, the pasteurizing plant, homogenization, freezing, flavoring, packaging and distribution.

Announcement has been received of the appointment of Cleora Ewalt to the staff of the Home Economics Institute, *Westinghouse Electric and Manufacturing Company*. Miss Ewalt will conduct "Health for Victory" nutrition meetings at war plants in Ohio, Michigan, Kentucky, Pennsylvania, and West Virginia.